

**Memoirs of the  
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**MEMOIRS**  
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**NATIONAL MUSEUM OF VICTORIA**  
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# A TAXONOMIC AND ZOOGEOGRAPHIC STUDY OF TASMANIAN CADDIS-FLIES (INSECTA: TRICHOPTERA)

By ARTURS NEBOISS

Curator of Insects, National Museum of Victoria

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# A TAXONOMIC AND ZOOGEOGRAPHIC STUDY OF TASMANIAN CADDIS-FLIES (INSECTA: TRICHOPTERA)

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## Abstract

The systematics of the Trichoptera of Tasmania (excluding the two island groups in Bass Strait) is examined. For easier assessment the island is subdivided into seven provinces, the boundaries of which are based on a combination of landforms, geological features, vegetation and climatic conditions.

About 18 000 specimens, most of which were collected by the author between the years 1965 and 1974, were examined. There are now 157 species recognized in Tasmania, which are placed in 66 genera and 21 families, of which 16 genera and 64 species are described as new. Due to changes in higher classification, several new family names appear, and three families are recorded from the state for the first time—families Stenopsychidae, Kokiriidae and Oeconesidae, the latter not being known from the Australian mainland.

Of the total caddis-fly fauna, 74% of the species appear to be endemic to Tasmania. The proportion of endemic species varies throughout the island, being highest in the two western provinces (73%), but lowest in the eastern provinces (50%). The fauna shows a high proportion of trans-antarctic elements, exhibiting close relationships with New Zealand and South American species.

## Introduction

The objective of this study is to determine the composition of the Tasmanian trichopteran fauna, which until recent years was very poorly known. Undoubtedly, further intensive collecting will reveal more, yet unknown species and the knowledge of the distribution of the presently known species will be greatly expanded. Information on immature stages is limited, but once studied in detail, will clarify many outstanding questions on the relationships between species, genera and families, particularly those with a trans-antarctic distribution.

The first three species of Trichoptera from Tasmania were recorded by Francis Walker (1852), when he described *Leptocerus magnus* (now *Triplectides*) and *Leptocerus oppositus* (now *Symphitoneuria*); as a third species he listed a variety of *Plectrotarsus gravenhorsti* Kolenati, which later was recognized and described by Mosely as a separate species—*Plectrotarsus tasmanicus*. This first record was followed by nearly 80 years of almost complete silence, with only an occasional reference to Trichoptera of the island. One such note appeared in the meeting notices of the Royal Society of Tasmania, regarding the erroneous

description of a mollusc, which proved to be an insect living in a snail-like case, made from sand grains (Dyer, 1879). Undoubtedly, this note refers to the larvae of the family Helicopsychidae. It was not until Mosely added further species between 1933 and 1936, that the number of species increased and reached the total of 18, placed in seven families. In the publication by Mosely and Kimmins (1953), the number of species was increased to 58, but with other publications, which appeared in the following years (Neboiss, 1959, 1962 and Jacquemart, 1965a and b), the total number of species recorded rose, and stood at 85 at the time when this study was started.

Most of the material was collected by the author during seven extensive collecting expeditions between 1965 and 1974, when more than 18 000 specimens were collected. Additionally, Dr E. F. Riek, of Canberra, made available his collection containing about 2000 specimens. Smaller numbers were obtained from other collectors. About 16 000 specimens of the available material have been identified to species and constitute the basis of this study. The remaining specimens are mainly females, which could be identified only to genus, or referred to species with some doubt.

Altogether 66 genera, containing 157 species and placed in 21 families are dealt with in this study; of these, 16 genera and 64 species are described as new. It was found that the available material contained all but eight species: the unique types of three were available for study, but for each of the remaining five, only a brief description is given.

Locality and collecting data are listed for each species following the description, and distribution is shown on the accompanying maps. Depository institutions are indicated in the text by the following abbreviations:

- ANIC— Australian National Insect Collection, Canberra
- BMNH— British Museum (Natural History), London
- IRScNB— Institut Royal des Sciences Naturelles de Belgique, Brussels
- LM— Zoological Museum, Leningrad
- MCZ— Museum of Comparative Zoology, Harvard University, Cambridge
- NMV— National Museum of Victoria, Melbourne
- NRS— Naturhistoriska Riksmuseet, Stockholm
- QM— Queensland Museum, Brisbane
- QU— Queensland University, Brisbane
- SAM— South Australian Museum, Adelaide
- TM— Tasmanian Museum and Art Gallery, Hobart.

### Acknowledgements

A study of this nature could not be accomplished without the assistance of many institutes and persons, therefore to all of them I wish to extend my gratitude and sincere thanks.

Especially I wish to thank Professor J. W. Warren, Chairman Department of Zoology, Monash University, Clayton, and Mr J. McNally, Director National Museum of Victoria, for making this study possible; to Dr G. Ettershank, Department of Zoology, Monash University, for his constructive criticism and encouragement throughout the preparation of this work; and to Mr Charles McCubbin, Melbourne, who with his skill and enthusiasm organized the first two collecting expeditions to Southwest Tasmania.

The author gratefully acknowledges the grant received from the Australian Biological Research Study, Interim Council, which made it possible to extend investigations to additional localities and aided the printing of this volume; the Tasmanian National Parks and Wildlife Service for permission to collect specimens within the National Parks, and the respective rangers for their personal interest and help; Dr P. S. Lake and Dr P. Taylor of the University of Tasmania, Hobart, for their co-operation; Dr E. F. Riek, CSIRO Division of Entomology, Canberra, for the loan of his extensive collection and valuable discussions, which helped to clarify many taxonomic problems; Prof G. Marlier and Dr S. Jacquemart of the Institut Royal des Sciences Naturelles de Belgique, Brussels, for the loan of type material in their custody; Dr P. C. Barnard of Department of Entomology, British Museum Natural History, London, Dr V. Ziltzova, of Zoological Museum, Leningrad, and Mr A. G. McFarlane of Canterbury Museum, Christchurch, New Zealand, for loan of types and other specimens; Dr H. H. Ross of the University of Georgia, Athens, Georgia, USA, Prof. J. Illies of Limnologische Flusstation, Schlitz, Germany, and Dr H. Malicky of Biologische Station Lunz, Lunz am See, Austria, for helpful discussions and advice on taxonomic problems.

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Sincere thanks are due to Mr I. Dimitis for the permission to use his excellent photographs to illustrate some of the most interesting localities.

Finally, and most of all, I would like to thank my wife, Austra, for her patience, never-ending encouragement and support throughout the years of study and for typing the manuscript. Without her help the completion of this study would have been so much more difficult.

### Study Area

#### 1. DESCRIPTION

The present study deals with material collected in Tasmania, although occasionally it has been necessary to include information on

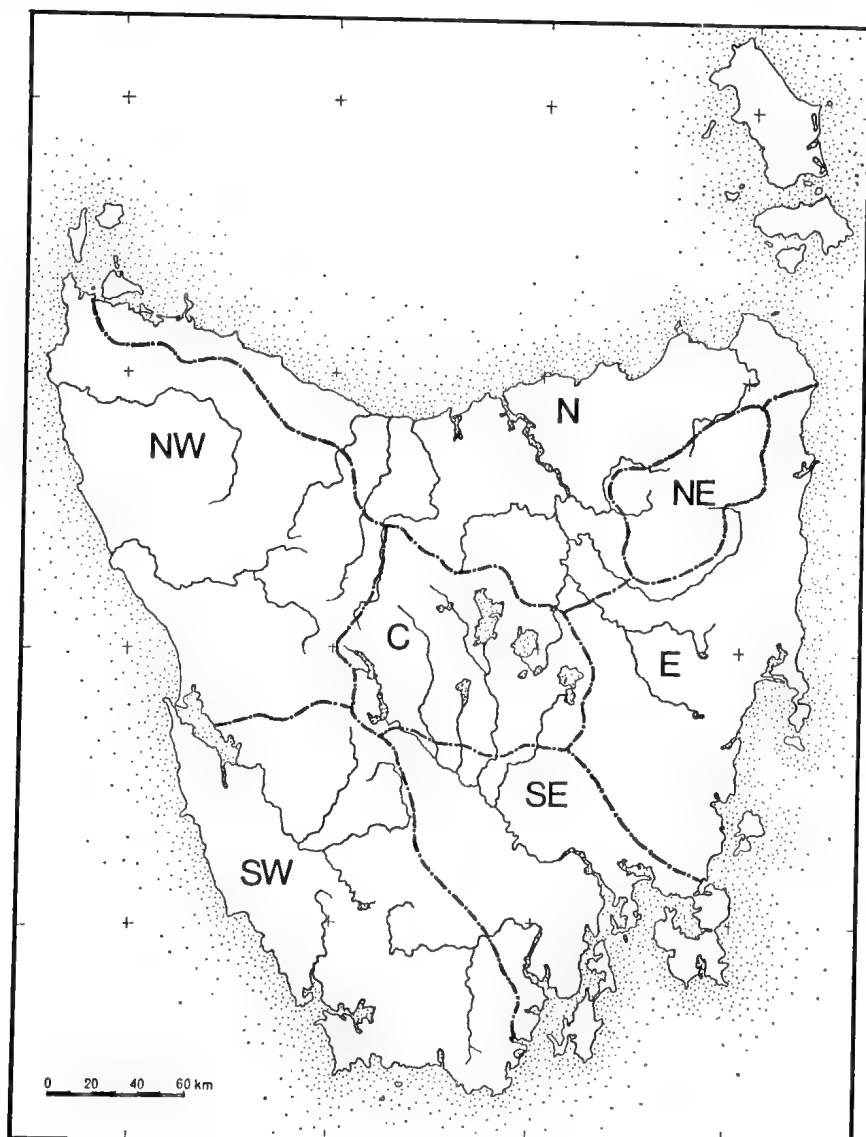


specimens from other Australian localities.

Physically, Tasmania is part of the East-Australian Highlands, but it is separated from the mainland by the relatively shallow Bass Strait. It is an island of 67 340 km<sup>2</sup>, located between 40° and 44° south latitude and 144°30' and 148°30' east longitude. This is an area dominated by strong westerly winds, but with an otherwise temperate oceanic climate. The mean summer (December-February) temperature ranges between 11°C on the highlands to 18°C on the Eastern coastal regions. The mean winter (June-August) temperatures are as low as 2°C on the highlands to 9°C on a narrow

coastal belt around the island. Maximum temperatures reach as high as 40°C in the South-east (Derwent River valley), and drop as low as -12°C on the central high plateau. The island is mostly mountainous and very little of its surface is classified as coastal lowlands.

For the purpose of analysing the composition of Tasmanian Trichoptera, it was necessary to subdivide the island into seven provinces, the boundaries of which are based on a combination of landforms (elevations, watersheds, etc.), geological features, vegetation and climatic conditions (particularly rainfall and temperature)—see Map 1.



Map 1—Boundaries of provinces.

The two island groups, including King and Flinders islands, just north of Tasmania, are excluded from the present survey, due to limited funds and time.

References to the provinces throughout the text are made in their abbreviated form by capital letters shown in parentheses below.

*Northern province* (N) includes the coastal heathlands along the NE coast, but otherwise it is dominated by dry sclerophyll forest and extensive areas of cleared, cultivated land. Relief mainly undulating, drainage northerly, main streams being rivers Forth, Mersey, South and North Esk, St. Patricks and Great Forester. Rainfall low along the coast, increasing to moderate towards the mountains; temperatures mild to warm.

*Northeastern province* (NE), a small, isolated highland area of the Ben Lomond/Mt Barrow massif, and the mountains to the North-east. Vegetation varies from rainforest to sclerophyll forest, cut by sections of cleared land; it includes a small area of moorland on the higher altitudes of Ben Lomond. Relief rugged, drainage in all directions; rainfall moderate, temperatures cool to moderate.

*Eastern province* (E) extends along the east coast from Eddystone Point in the North, to Marion Bay in the South and includes hill country east of the slopes of the Central province. It is dominantly dry sclerophyll forests with large sections of cleared land. Relief hilly, drainage easterly (George, Scamander, Swan and Prosser Rivers), and northerly (South Esk and Macquarie Rivers). Rainfall low—below 700 mm p.a., with a high fluctuation level in stream flows; temperatures mild to very warm, with low temperatures in winter.

*Central province* (C) structurally part of the Central Plateau, with altitudes above 900 m, is dominated by alpine humus soils, and being in a rain-shadow area, has rather poor vegetation—partly moorlands, partly dry sclerophyll forests. Relief high plateau, in parts with rugged areas; drainage mainly southern to the Derwent River tributaries with Lake River to the North. Natural stream flow severely disrupted by a highly developed hydro-electric industry, which also controls water level in lakes and lagoons. Low average temperatures.

*Northwestern province* (NW) occupying the area north of a line through Mt Sorell-Franklin River-Lake King William and west of the Central Plateau along the Mersey River. Vegetation is dominantly rain-forest type, with some sedge-lands and coastal heaths, interrupted by tracts of cleared land; mainly yellow podzolic soils. Relief hilly to rugged, drainage westerly with two major stream systems—Arthur and Pieman Rivers. Rainfall ranging from high in the southern part of the province to moderate in the north. Temperatures cool to moderate.

*Southwestern province* (SW) west of the line Lake King William-Mt Mueller-Hythe; vegetation with extensive sedgeland (often referred to as buttongrass plains from the dominant buttongrass *Gymnoschoenus sphaerocephalus*) and tracts of rainforests; skeletal soils and moor podzol peats. Relief dominated by rugged mountain ranges and swampy plains; drainage north-westerly by Gordon River system and south-easterly by Huon River. High to very high rainfall—over 2500 mm p.a. Temperatures vary from warm to cold.

*Southeastern province* (SE) includes most of the lower section of Derwent River basin; vegetation mainly sclerophyll forests with extensive areas of cleared land and some rainforests in the western part of the province. Relief characterized by hilly terrain, river valleys and some rugged mountain ranges; drainage south-westerly. Rainfall rapidly decreases from 1500 mm p.a. in the west, to less than 800 mm p.a. in the east. Temperatures vary from mild to hot.

## 2. DISTRIBUTION OF LOCALITIES

There are 130 localities for which either exact or at least approximate location is known; all these are marked and numbered on the accompanying map (Map 2). Data of locality labels have been given in their original form, and distances, were given in miles, were not converted into kilometres. One locality, if labelled differently by several collectors, or two localities being very close to each other, are marked by only one number on the map. The locality 'Great Lake' is on all occasions regarded as the area near Miena; 'Lake Pedder' refers to boundaries of the natural lake and the

surrounding National Park, where the specimens were collected before its flooding by the Hydro-electric development scheme, converting it into a greatly enlarged water reservoir. Incompletely specified localities, such as 'Tasmania', 'Derwent River' or similar, have for obvious reasons been omitted from the map altogether.

#### *N Province*

- 1 Wilson Creek nr. Hellyer (Pebbly Bay)
- 2 Burnie
- 3 Guide River Falls nr. Ridgley
- 4 Ulverstone, 4 km NW, small waterfalls on the coast
- 5 Leven River nr. Heka
- 6 Wilmot River, 10 km S of Forth
- 7 Wilmot and Forth Falls
- 8 Sheffield
- 9 Minnow River nr. Paradise
- 10 Mersey River, Liena
- 11 Small creek, 4 km E of Liena
- 12 Creek nr. Marakoopa Caves
- 13 Sassafras Creek, 4 km W of Mole Creek
- 14 Rubicon River, 8 km SE of Sassafras
- 15 Meander River, Deloraine
- 16 Quamby Brook, 1 km E of Golden Valley
- 17 Liffey River, 5 km W of Liffey
- 18 Saxon Creek, 10 km NW of Frankford
- 19 Franklin River, Frankford
- 20 Meander River, 3 km N of Westbury
- 21 Lake River, 5 km SW of Delmont
- 22 South Esk River, Evandale
- 23 Lilydale, a small creek 2 km N of town
- 24 St. Patricks River, Targa
- 25 Scottsdale
- 26 Great Forester River, 5 km NW of Forester
- 27 Waterhouse estate, 25 mls NE of Scottsdale
- 28 Launceston, Cataract Gorge

#### *NE Province*

- 29 Mt Barrow, 2500 ft.
- 30 North Esk River nr. Blessington or 20 mls E of Launceston
- 31 St. Columba Falls, Pyengana

#### *E Province*

- 32 Scamander River, Upper Scamander

- 33 Apsley River nr. Bicheno
- 34 Macquarie River, 8 km W of Campbell Town
- 35 Isis River nr. Auburn
- 36 Lake Leake
- 37 Tooms Lake
- 38 Buxton River nr. Mayfield
- 39 Prosser River, Orford
- 40 Prosser River, 2 km W of Buckland
- 41 Andover, York Rivulet
- 42 Oatlands, small creek 5 km W

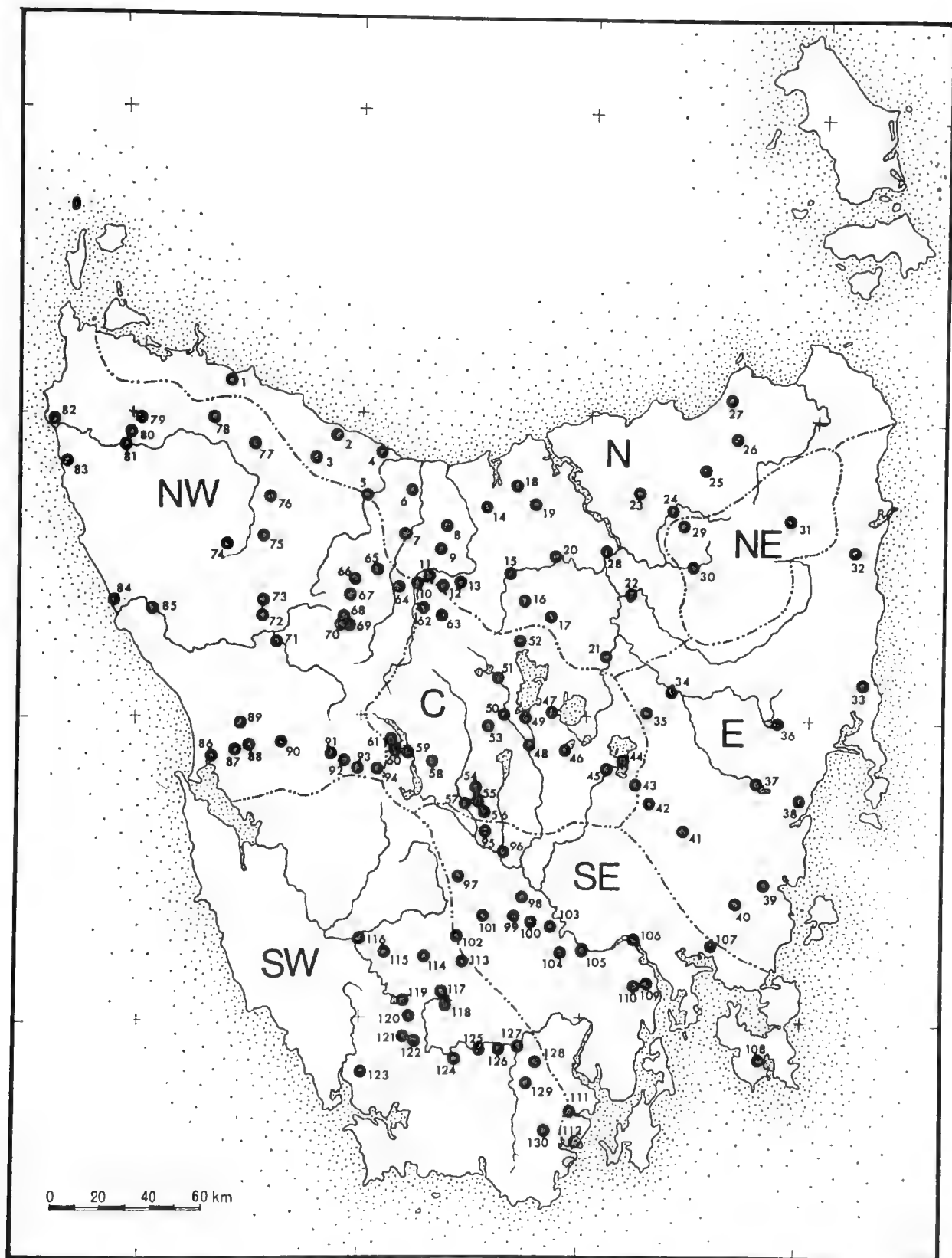
#### *C Province*

- 43 Blackman River, 15 km NW of Oatlands
- 44 Interlaken, canal and Lake Sorell
- 45 Clyde River, nr. Interlaken
- 46 Lagoon of Islands
- 47 Arthurs Lake
- 48 Penstock Lagoon, Waddamana
- 49 Great Lake, Miena, Shannon Lagoon and Shannon River
- 50 Ouse River, 8 km W of Miena; (also 5 mls W of Miena)
- 51 Lake Augusta, Howe Lagoon and Western Lakes
- 52 Pine Creek, 5 km N of Breona
- 53 Little Pine Lagoon and Little Pine River
- 54 Nive River, 2 km W of Bronte
- 55 Bronte Lagoon and Bronte-Bradys Canal
- 56 Bradys Lake
- 57 Small creek 5 km W of Bronte
- 58 Clarence River, 9 km E of Derwent Bridge
- 59 Derwent River, 2 km NW of Derwent Bridge
- 60 Lake St. Clair, Derwent basin, Cynthia Bay
- 61 Hugel River, Cuvier River and Mt Rufus, West of Lake St. Clair
- 62 Snake Creek, Fisher River Road
- 63 Fisher River, Pencil Pine Grove below Lake Mackenzie dam

#### *NW Province*

- 64 Mersey River trib. 4 km W of Liena
- 65 Bulls Creek, Cradle Mtn. Road; also 15 mls S of Wilmot
- 66 Iris River tributary, 15 km N of Cradle Mtn.

- |     |   |     |  |
|-----|---|-----|--|
| 67  | Pencil Pine River, 6 km N of Cradle Mtn.                      | 103 | Bushy Park, Derwent River                            |
| 68  | Waldheim, Cradle Mtn. National Park                           | 104 | Plenty River, 6 km E of Moogara                      |
| 69  | Dove River, Cradle Mtn. National Park                         | 105 | Derwent River, 3 km W of New Norfolk and New Norfolk |
| 70  | Lake Lilla, Cradle Mtn. National Park                         | 106 | Bridgewater, Derwent River                           |
| 71  | Murchison River, Murchison h-way                              | 107 | Sorell River, 3 km N of Sorell                       |
| 72  | Mackintosh River, Murchison h-way                             | 108 | Port Arthur  |
| 73  | Farm Creek, 4 km N of Tullah                                  | 109 | Strickland Ave., Hobart                              |
| 74  | 5 mls S of Waratah, and 3 mls E of Waratah                    | 110 | Mt Wellington  |
| 75  | Fossey River, 10 mls S of Hellyer River Gorge                 | 111 | Creekton River nr. Dover                             |
| 76  | Hellyer River Gorge, Waratah h-way bridge                     | 112 | Hythe  |
| 77  | Flowerdale River, Meunna                                      |     | <i>SW Province</i>                                   |
| 78  | Dip River Falls, 10 km S of Mawbanna                          | 113 | Damper Inn, Port Davey Track, Mt Mueller area        |
| 79  | Duck River, 6 km SW of Roger River                            | 114 | Wedge River, 30 mls W of Maydena                     |
| 80  | Eckberg Creek, 12 km SW of Roger River                        | 115 | 40 mls W of Maydena (Strathgordon Road)              |
| 81  | Arthur River bridge, 15 km SW of Roger River                  | 116 | Gordon River (now Strathgordon) 50 mls W of Maydena  |
| 82  | Bluff Hill creek, 12 km S of Marrawah                         | 117 | Huon River Crossing                                  |
| 83  | Sundown Creek, 25 km S of Marrawah                            | 118 | Condominion Creek nr. Mt Eliza                       |
| 84  | Rupert Point, 3 mls N of Pieman River                         | 119 | Lake Pedder  |
| 85  | Corinna   | 120 | Huon Plains, nr. Scotts Peak                         |
| 86  | Hogarth Falls, Strahan  | 121 | West Arthur Plains                                   |
| 87  | 10 mls E of Strahan   | 122 | Junction Creek, West Arthur Plains                   |
| 88  | 10 km SW of Queenstown  | 123 | Spring River   |
| 89  | Henty River, 12 km NW Queenstown                              | 124 | Cracroft River                                       |
| 90  | King River, Lyell h-way bridge                                | 125 | Huon River nr. Blakes Opening                        |
| 91  | Collingwood River bridge, Lyell h-way (30 km E of Gormanston) | 126 | Port Davey track 4 km W of Picton River              |
| 92  | Franklin River, 20 km SW of Derwent Bridge                    | 127 | Huon-Picton River junction                           |
| 93  | Arrowsmith Creek, 18 km SW of Derwent Bridge                  | 128 | Arve River, 10 km W Geeveston                        |
| 94  | Navarre River, Lyell h-way                                    | 129 | Hartz Mtn. National Park                             |
|     |   | 130 | Hot Springs Creek nr. Hastings Caves                 |
|     | <i>SE Province</i>  |     | <b>Methods</b>                                       |
| 95  | Black Bobs Creek, 15 km NW of Ouse                            |     | COLLECTION AND PRESERVATION                          |
| 96  | Dee River, 8 km NW of Ouse                                    |     | To obtain material used in this study, several       |
| 97  | Cashion Creek Cave, Florentine Valley                         |     | collecting methods were employed. During the         |
| 98  | Ellendale   |     | day and in the early hours of evening the cus-       |
| 99  | Russell Falls, National Park and Tyenna River                 |     | tomary hand-net was used to capture in-              |
| 100 | Styx River, Westerway   |     | dividuals in flight, or by sweeping vegetation in    |
| 101 | Lake Dobson, also Broad River, Mt Field Nat. Park             |     | the vicinity and along the banks of fresh-water      |
| 102 | Florentine River, 7 mls W of Maydena                          |     | bodies.  |
|     |   |     | Searching on the underside of bridges and            |
|     |   |     | the interior surfaces of culverts under roads        |
|     |   |     | proved to be very productive and was widely          |
|     |   |     | used while travelling. Nevertheless, the number      |
|     |   |     | of specimens obtained by these methods was           |



Map 2—Distribution of localities.

never as large as that obtained by collecting with a mercury-vapour light source during evening and night.

A portable generator of 240V 600W or 1000W output was used as the power unit for 150W to 500W blended or clear glass lamps. The type used depended on their availability. During rainy weather a clear polythene sheet was suspended above the lamp in a tent-like fashion to protect the globe from cracking. On some occasions a 15W black light fluorescent tube was used, but with much less success. There was no attempt made to compare the attractive power of the various types of lamps used.

The specimens were collected from twilight to midnight, or sometimes even later. Collecting was done by hand from two white sheets, one hung vertically, facing the body of water close behind the lamp, the other horizontally below the lamp on the ground.

During unfavourable weather conditions, when only small numbers of specimens were attracted to the light, all of them were collected and preserved. When large numbers were attracted, a selective collection of specimens was made. To obtain the largest possible number of species, the observation of difference in size, colour, behaviour, etc. was of utmost importance.

The number of specimens attracted to the light varied considerably, depending on the season and weather conditions. Collecting usually came to a complete standstill when the evening temperature dropped below 8°C. The occurrence of cool evening breezes or sudden wind gusts reduced activity also, and specimens already on sheets became entirely motionless. Light rain did not interrupt flying, so long as the temperature stayed favourable. No samples were collected with artificial light during the dark hours immediately before sunrise.

Most specimens were killed and preserved in 80% ethanol, and only a small number were killed in ethyl-acetate or cyanide vapour for dry preservation as pinned specimens. This method was employed to help in identification of colour pattern on wings and body.

The material preserved and permanently stored in ethanol, was placed in small glass vials, with one or several specimens in each vial. Written or printed locality labels were placed within individual vials, to which the identification labels were added when the material was finally sorted. The individual vials were then sorted by taxa and placed into larger jars for permanent storage.

#### PREPARATION AND ILLUSTRATION OF SPECIMENS

Description of species usually was prepared from specimens preserved in ethanol with additional details, particularly, colour pattern of wings, taken from dried specimens whenever they were available. Although colouration is of limited importance, because it varies considerably with the age of the specimens, it is still useful for correct correlation of sexes, and to a certain degree, for identification of species when the specimens are preserved dry and the hairs are not denuded.

Association of males and females was either assured when pairs *in copula* were obtained in the field and preserved separately, or by carefully matching specimens from one locality.

The wings from the right side of the body were detached and used for illustrations. They were removed from the specimens, preserved in ethanol, transferred to a microscope slide and orientated; after adding a small drop of glycerol, a cover-glass was placed over the specimen. Wing drawings were made with the aid of a camera lucida on a stereo binocular microscope. The same method of drawing was applied for head and thoracic parts, using specimens in ethanol. The hyaline areas of the anterior wings have characteristic shape and position which is diagnostic to individual families. These areas are indicated in the wing drawings by oblique line shading. The terminology for wing venation is the same as used by Mosely and Kimmins (1953).

Examination and drawing of male and female genitalia was done after the entire abdomen had been cleared in boiling KOH, washed and replaced in glycerol. Genitalia drawings were made with the aid of a camera lucida on a monocular microscope.

The two Australian mainland species—*Plectrocnemia australica* Banks and *Anisocentropus bicoloratus* (Martynov) are described and figured, but not numbered.

## KEY TO THE FAMILIES

1. Scutellum flat, triangular, pointed posteriorly, margins vertical; mesoscutum without warts; wings narrow, slender, more or less pointed apically; fringes very long, those of posterior wings usually longer than the width of the wing. Maxillary palpi 5-segmented in both sexes. Size small, length of anterior wing less than 4 mm . . . . . Hydroptilidae
- Scutellum rounded posteriorly, convex, without vertical margins; wings proportionally broad, fringes usually short, less than the width of the wing. Maxillary palpi with variable number of segments. Size generally larger, length of anterior wing more than 4 mm . . . . . 2
2. Ocelli present . . . . . 3
- Ocelli absent . . . . . 7
3. Maxillary palpi 5-segmented in both sexes . . . . . 4
- Maxillary palpi 3-segmented in males, 5-segmented in females . . . . . 6
4. Maxillary palpi with segment 5 barely longer than segment 4, not flexible . . . . . 5
- Maxillary palpi with segment 5 distinctly longer than segment 4, flexible . . . . . Philopotamidae
5. Second segment of maxillary palpi elongate, longer than segment 1 . . . . . Rhyacophilidae
- Second segment of maxillary palpi short, not longer than segment 1, extended laterally to globular projection . . . . . Glossosomatidae
6. Scutum with posterolateral warts level with scutellum . . . . . Plectrotarsidae
- Scutum without posterolateral warts . . . . . Limnephilidae
7. Terminal segment of maxillary palpi longer than the preceding segment, flexible . . . . . 8
- Terminal segment of maxillary palpi about the same length as the preceding segment . . . . . 11
8. Anterior wings with  $R_1$  not forked at apex . . . . . Ecnomidae
- Anterior wings with  $R_1$  not forked at apex . . . . . 9
9. Mesoscutum with a pair of warts . . . . . 10
- Mesoscutum without warts . . . . . Hydropsychidae
10. Mesoscutal warts separated by anteriorly extended section of scutellum . . . . . Stenopsychidae
- Mesoscutal warts not separated by scutellum . . . . . Polycentropodidae
11. Maxillary palpi six segmented (in both sexes) . . . . . Calamoceratidae
- Maxillary palpi one to five segmented in males, always 5-segmented in females . . . . . 12
12. Maxillary palpi segment 1 short with more or less distinct mesal nodule near apex . . . . . Philorheithridae
- Maxillary palpi segment 1 without mesal nodule . . . . . 13
13. Antennae distinctly longer than anterior wings, particularly in males; mesoscutum with two groups of more or less parallel rows of setiferous punctures . . . . . 14
- Antennae usually as long as anterior wings, seldom slightly longer; mesoscutum either with warts or entirely without warts or setiferous punctures . . . . . 15
14. Posterior wing with a row of macrotrichia along basal half of the costal margin . . . . . Odontoceridae
- Posterior wing with a short row or rows of curved macrotrichia along costal margin about opposite the discoidal cell . . . . . Leptoceridae
15. Mesoscutum with a pair of warts . . . . . 16
- Mesoscutum without warts . . . . . 19
16. Mesoscutal warts elongate, narrow . . . . . 17
- Mesoscutal warts short, rounded . . . . . 18
17. Scutellum with a pair of elongate warts, maxillary palpi in male 3-segmented . . . . . Kokiriidae
- Scutellum with a single median wart, maxillary palpi in male single segmented . . . . . Oeconesidae
18. First antennal segment very long, exceeding the length of the head; basal half of



- the costal margin in posterior wings with a row of hamuli; maxillary palpi 2-segmented in males . . . . Helicopsychidae
- First antennal segment about as long as the head; posterior wings with bristle-like hairs along the costal margin; maxillary palpi 4-segmented in males . . Tasimiidae
19. Pronotum with two pairs of warts—the middle pair small, rounded, the lateral pair larger, somewhat elongate (except *Caenota* males, which have only one pair of elongate warts) . . . . . Calocidae
- Pronotum with only one pair of elongate warts . . . . . 20
20. Maxillary palpi 5-segmented in males . . . . . Helicophidae
- Maxillary palpi 1-3-segmented in males . . . . . Conoesucidae

#### SUPERFAMILY RHYACOPHILOIDEA

Wing venation entire; maxillary palpi with terminal segment simple, cylindrical. Larvae campodeiform, head prognathous, either free living or constructing portable cases.

#### 1 Family RHYACOPHILIDAE Stephens (1836)

*Family diagnosis:* Ocelli present. Antennae slender, as long as or slightly shorter than anterior wing; basal segment stout, shorter than head. Maxillary palpi 5-segmented, alike in both sexes; first two segments very short, the following ones long, cylindrical. Wings elongate, vestiture variable; discoidal cell in both wings either open or closed, in posterior wing sometimes absent. Anterior wing with forks 1, 2, 3, 4 and 5 present;  $R_1$  usually forked at apex; thyridial cell always present; additional cross-veins C-Sc and Sc- $R_1$  sometimes present. Posterior wing shorter, forks variable, but at least 2 and 5 present.

Spurs 1:4:4; 2:4:4 or 3:4:4.

The family is here divided into three subfamilies. Subfamily Rhyacophilinae with spurs 3:4:4 has not yet been recorded from the Australian region. The Australian species have been placed in two subfamilies—Hydrobiosinae and Apsilochoreminae, both with spurs 2:4:4, except in genus *Ulmerochorema* (Hydrobiosinae) which has spurs 1:4:4.

Following the revision of Australian Hydrobiosinae by Neboiss (1962), more extensive collecting has continued and new material accumulated not only from Tasmania, but also from other Australian localities. The information available from the analysed Tasmanian specimens indicate that the taxonomic grouping could not be regarded as fully established and further changes are imminent.

It was observed that the ridge on the sternite 5 in the females has two basic positions. In one group the ridge curves upwards and terminates at the anterior margin of the sternite, in the second group this ridge terminates at the lateral margin. The first position occurs only in two genera—*Apsilochorema* and *Allochorema*—indicating their close affinity. The anterior wing in both genera with the cross-vein C-Sc present, fork 1 either short, or absent in some *Apsilochorema* species. The males of the genus *Apsilochorema* have a more or less developed, oblique pouch at the middle of the anterior wing. It has been recorded (Ulmer, 1957; Neboiss, 1962; Lepneva, 1964) that the larvae of *Apsilochorema* have simple and not chelate anterior legs (Fig. 17). The larvae of the genus *Allochorema* are not known. These two genera are now placed in a new subfamily Apsilochoreminae.

The subfamily Hydrobiosinae is arranged in two tribes—the Hydrobiosini and Psyllobetini.

The genera with anterior wings evenly pubescent, without hair tufts, open discoidal cell in the male anterior wings and the abdomen terminating in a long, slightly upcurved oviscapt in the females, are placed in a new tribe Psyllobetini. To this tribe belong genus *Psyllobetina* Banks, distributed from Queensland to Victoria, genus *Allobiosis* Mosely, known from New South Wales only, genus *Moruya* Neboiss endemic to Tasmania, and the New Zealand endemic genus *Tiphobiosis* Tillyard. All other genera are placed in the tribe Hydrobiosini.

The species originally placed in the genus *Taschorema*, exhibited a number of morphological differences, including the position of warts and ocelli on the head, shape of terminal segments of the female abdomen, presence or absence of lateral filaments on abdominal seg-



ment 5 in the males, various hair-structures on male wings and wing venation in general. Supported by the newly discovered species from Tasmania, this group now has been divided into three separate genera—*Taschorema* (sensu stricto), *Ethochorema* and *Ptychobiosis*. Further research on Australian mainland species might call for even further changes.

The free living larvae of Hydrobiosinae and Apsilochoreminae are predacious, mainly on other aquatic insects. They are slender, pale-yellowish or greenish in colour, with only the head and pronotum sclerotized. The larvae make a pupal chamber of cemented sand grains, within which they spin a smooth, cylindrical cocoon, secured at both ends to the chamber.

A new generic key for all Australian genera replaces the one published by Neboiss (1962).

#### KEY TO AUSTRALIAN GENERA

1. Posterior wing with irregular venation in both sexes;  $R_1$  joins Sc, runs with it for a short distance, then diverges and connects with  $R_{2+3}$  before reaching wing margin  
*Koetonga*
- Posterior wing with regular venation, Sc and  $R_1$  entirely separate, connected with short cross vein or joined together shortly before the wing margin . . . . . 2
2. Posterior wing—fork 2 with footstalk (sometimes very short) . . . . . 3
- Posterior wing—fork 2 sessile . . . . . 7
3. Anterior wing—fork 1 short . . . . . 4
- Anterior wing—fork 1 long . . . . . 5
4. Posterior wing—fork 2 longer than its footstalk . . . . . *Apsilochorema*
- Posterior wing—fork 2 about as long or shorter than its footstalk . . *Allochorema*
5. Anterior wing—fork 4 about as long as fork 3 . . . . . *Austrochorema*
- Anterior wing—fork 4 distinctly longer than fork 3 . . . . . 6
6. Posterior wing—fork 2 with footstalk very short (about as long as the width of fork); discoidal cell in anterior wing open in male, usually closed in female  
. . . . . *Ipsobiosis*

- Posterior wing—fork 2 with footstalk longer than fork (except *U. brevis*) at least twice as long as the width of the fork; discoidal cell in anterior wing closed in both sexes . . . . . *Ulmerochorema*
7. Anterior wing with discoidal cell open (except in females of the genus *Moruya*); females with abdomen terminating in a long, upturned ovipositor . . . . . 12
- Anterior wing with discoidal cell closed; females with abdomen terminating bluntly . . . . . 8
8. In posterior wing  $R_1$  merges with Sc shortly before reaching margin . . . . . *Ptychobiosis*
- In posterior wing  $R_1$  either connected to Sc with short cross vein or completely separate . . . . . 9
9. In anterior wing—fork 1 sessile . . 10
- In anterior wing—fork 1 with footstalk . . . . . *Ethochorema*
10. Posterior wing in males with elongate cell-like structure between  $Cu_2$  and  $A_1$ , androconia on  $A_2$  and  $A_3$  present . . . . . *Taschorema*
- Posterior wings in males without cell-like structure and without androconia . . 11
11. Lateral ocelli touching anterior warts . . . . . *Tanjilana*
- Lateral ocelli not touching anterior warts . . . . . *Megogata*
12. In posterior wing—fork 1 present, and with footstalk . . . . . *Moruya*
- In posterior wing—fork 1 absent . . 13
13. In anterior wing—fork 2 very long, about twice as long as fork 3 . . . *Psyllobetina*
- In anterior wing—fork 2 short, about as long as fork 3 . . . . . *Allobiosis*

#### Subfamily APSILOCHOREMINAE

##### subfam. n.

*Diagnosis:* In females the ridge on sternite 5 terminates at the anterior margin (Figs. 5 and 6). The larvae with prosternum membranous; anterior legs with trochanter and femur fused and greatly enlarged, tibia and tarsus short, subequal, claw long and thin (Fig. 17).

### Genus *Apsilochorema* Ulmer

*Apsilochorema* Ulmer, 1907:206; Ross and King, 1951:503; Ross, 1956:124; Kimmins, 1960:184; Neboiss, 1962:526.

*Bachorema* Mosely in Mosely and Kimmins, 1953:493; Neboiss, 1957:83.

Type species: *Psilochorema indicum* Ulmer, 1905.

Wing venation differing in sexes, regular in females, irregular in males; anterior wing with forks 1, 2, 3, 4 and 5 present, in males an oblique pouch along footstalk between base of fork 4 and Rs. Cu<sub>2</sub> sometimes joined with A<sub>1</sub> just above arculus; posterior wings similar in both sexes, forks 1, 2, 3 and 5, or only 2, 3 and 5 present, all with footstalks. In male the lateral filaments on sternite 5 present; in female the ridge on sternite 5 terminates at the anterior margin (Figs. 5 and 6). Ventral processes short or moderately long on sternites 6 and 7, or 7 only in males; on sternite 5 and 6 in females.

Spurs 2:4:4.

Genus distributed from Ceylon and India to Japan, Siberia and south to Fiji, New Guinea and Australia. Two species in Tasmania.

#### KEY FOR SEPARATING TASMANIAN SPECIES

1. Posterior wing with apical forks 1, 2, 3 and 5 present . . . . . *obliquum*
- Posterior wing with apical forks 2, 3 and 5 only . . . . . *gisbum*

#### 1 *Apsilochorema obliquum* (Mosely)

#### Figures 1-9

*Bachorema obliqua* Mosely in Mosely and Kimmins, 1953:494; Neboiss, 1957:84.

*Apsilochorema obliqua*, Ross, 1956:124.

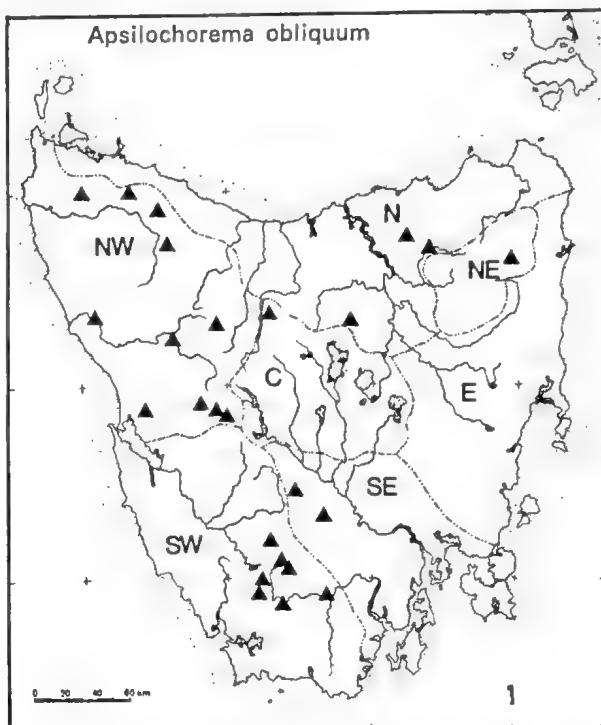
*Apsilochorema obliquum*, Neboiss, 1962:527.

Insect dark, blackish-brown, with distinct tufts of dark, erect hairs on anterior wing which create mottled appearance; posterior wing with forks 1, 2, 3 and 5 present.

♂ genitalia with segment 10 long, terminating with a pair of downturned, strongly chitinized hooks; inferior appendages long, stout, with short, finger-like process arising from the inner margin near apex. Phallus charate.

♀ abdomen terminates bluntly, somewhat triangular from side, a pair of small, sacklike depressions between tergites 8 and 9.

Length of anterior wing: ♂ 7-8.5 mm; ♀ 8-9.5 mm.



Type material: Type ♂ National Park, Qld., 26 Dec. 1921 (BMNH). Type not seen.

Material examined: Tasmania—2 ♀ St. Patricks River, Targa, 22 Feb. 1971; 2 ♀ St. Columba Falls, Pyengana, 21 Feb. 1971; 2 ♀ Russell Falls, National Park, 15 Nov. 1972; 1 ♀ Corinna, 5 Nov. 1972; 1 ♂ Flowerdale River, Meunna, 4 Nov. 1972; 2 ♂ 3 ♂ Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971; 1 ♂ Hellyer River Gorge, 2 Dec. 1972, P. Zwick; 1 ♀ same loc., 12 Dec. 1974; 1 ♂ 2 ♀ Franklin River 20 km SW of Derwent Bridge, 11 Feb. 1971; 1 ♂ Cashion Creek Cave, Florentine Valley, 29 Dec. 1964, T. Goede; 15 ♂ 5 ♀ Condominion Creek, 15 Feb. 1971; 3 ♂ 2 ♀ Wedge River, 17 Feb. 1971; 1 ♂ West Arthur Plains, 6 Feb. 1965; 1 ♂ 9 ♀ Huon River Crossing, 16 Feb. 1971; 1 ♀ Huon Plains nr. Scotts Peak, 8 Feb. 1965; 1 ♀ Cracroft River, 8 Feb. 1966; 2 ♂ 3 ♀ Huon-Picton River junction, 18 Feb. 1967; 3 ♂ 1 ♀ Duck River 6 km SW Roger River, 29 Nov. 1974; 1 ♂ Dove River, Cradle Mtn. Nat. Park, 14 Dec. 1974; 1 ♂ 1 ♀ Arrowsmith Creek 18 km SW of Derwent Bridge, 9 Dec. 1974; 1 ♀ Dip River Falls, 1 Dec. 1974; 2 ♀ Liffey River 5 km W of Liffey, 2 Dec. 1974; 1 ♂ Snake Creek area, Fisher River Road, 15 Dec. 1974; 1 ♀ Lilydale, creek 2 km N, 16 Dec. 1974; 1 ♀ Collingwood River bridge, Lyell h-way, 9 Dec. 1974. All specimens collected by A. Neboiss, except where stated otherwise (NMV). 4 ♀ Murchison River, 5 Feb. 1967, E. F. Riek (ANIC); 7 ♂ 2 ♀ Franklin River, 10 Feb. 1967, E. F. Riek (ANIC); 1 ♀ Hellyer Gorge, 4 Feb. 1967, E. F. Riek (ANIC); 1 ♂ 6 mls E Queens-

town, 8 Feb. 1967, E. F. Riek (ANIC); 1 ♂ 10 mls E Strahan, 20 Feb. 1963, I. F. B. Common and M. S. Upton (ANIC).

**Distribution:** Tasmania—all provinces except E province; Queensland; New South Wales; Victoria.

## 2 *Apsilochorema gisbum* (Mosely)

Figures 10-16

*Bachorema gisba* Mosely in Mosely and Kimmins, 1953:494; Neboiss, 1957:85.

*Apsilochorema gisba*, Ross, 1956: 124.

*Apsilochorema gisbum*, Neboiss 1962: 527.

In general appearance this species is similar to *Apsilochorema obliquum*, but differs in the male by having a smaller pouch in the anterior wing and distinctive genitalia. The posterior wing in both sexes without fork 1.

♂ genitalia with segment 10 about as long as the superior appendages which are broad, elongate, triangular from side. Inferior appendages long, stout, with curved, inwardly directed finger-like process near apex. Phallus cylindrical.

♀ abdomen terminates bluntly; there are no sacklike depressions between segments 8 and 9. Length of anterior wing: ♂ 7-8.5 mm; ♀ 8.5-10 mm.

**Type material:** Type ♂ Gisborne, Vic. 25 Feb. 1917 (BMNH). Type not seen.

**Material examined:** Tasmania—16 ♂ 14 ♀ Derwent River 2 km NW of Derwent Bridge, 12 Feb. 1971; 1 ♂ North Esk River nr. Blessington, 1 Mar. 1967; 4 ♀ Scamander River, Upper Scamander, 9 Nov. 1972; 4 ♀ Leven River nr. Heka, 17 Nov. 1972; 11 ♀ South Esk River, Evandale, 1 Mar. 1967; 1 ♀ Ouse River 8 km W of Miena, 28 Feb. 1967; 5 ♀ Hellyer River Gorge, 9 Feb. 1971; 1 ♀ Franklin River 20 km SW of Derwent Bridge, 11 Feb. 1971; 9 ♀ Mersey River, Liena, 16 Nov. 1972; 1 ♀ St. Patricks River, Targa, 22 Feb. 1971; 1 ♀ St. Columba Falls, Pyengana, 21 Feb. 1971; 3 ♀ Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971; 25 ♂ 12 ♀ Huon-Picton River junction, 18 Feb. 1967; 1 ♀ same loc. 15 Nov. 1972; 1 ♀ Huon River nr. Blakes Opening, 9 Feb. 1966; 1 ♂ Rubicon River 8 km SE of Sassafras, 2 Dec. 1974; 4 ♂ Lake St. Clair, 5 Dec. 1974; 1 ♂ Dip River Falls, 1 Dec. 1974; 1 ♂ Tooms Lake, 4 Dec. 1974; 3 ♀ Collingwood River Bridge, Lyell h-way, 9 Dec. 1974; 1 ♀ Andover, York Rivulet, 4 Dec. 1974; 1 ♀ Dee River 8 km NW of Ouse, 9 Dec. 1974. All specimens collected by A. Neboiss (NMV). 4 ♀ Derwent Bridge, 12 Feb. 1967, E. F. Riek (ANIC); 1 ♀ Ouse River 5 mls W Miena, 28 Feb. 1967, E. F. Riek (ANIC); 1 ♀ Lake St. Clair, 13 Feb. 1967, E. F. Riek (ANIC); 1 ♀ Murchison River, 5 Feb. 1967, E. F. Riek (ANIC); 3 ♀ Forth Falls, 28 Jan. 1967, E. F. Riek (ANIC); 2 ♀ Evandale, 1 Mar. 1967 E. F. Riek (ANIC).

**Distribution:** Tasmania—all provinces; Queensland; New South Wales; Victoria; South Australia.

## Genus *Allochorema* Mosely

*Allochorema* Mosely in Mosely and Kimmins, 1953: 491; Ross, 1956:124; Neboiss, 1962:529.

**Type species:** *Allochorema tasmanica* Mosely, 1953.

Wing venation similar in both sexes; anterior wing with discoidal cell open, forks 1, 2 and 3 short with long footstalks, forks 4 and 5 long, about equal in length; in posterior wing discoidal cell open, fork 1 absent, fork 2 with long footstalk. The lateral filament on sternite 5 in male two-segmented, base somewhat elongate, bulbous; in female the ridge on sternite 5 terminates at the anterior margin of the sternite. Only one species in Tasmania.

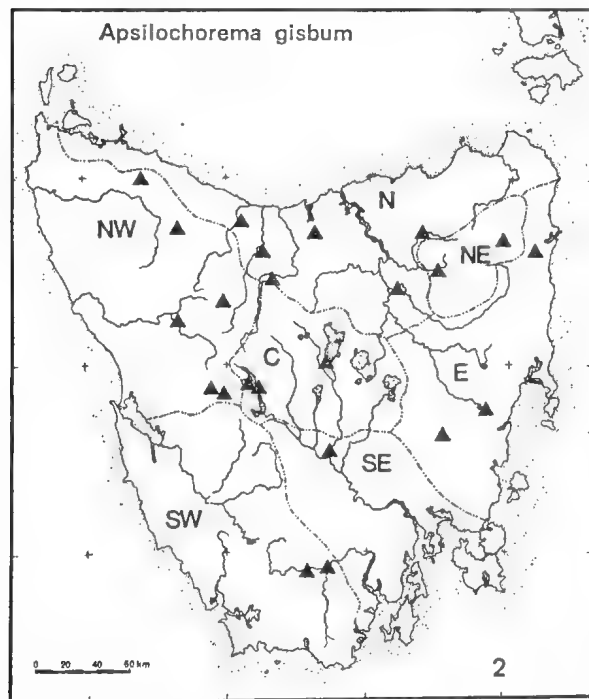
Spurs 2:4:4.

## 3 *Allochorema tasmanicum* Mosely

Figures 19-22

*Allochorema tasmanica* Mosely in Mosely and Kimmins, 1953:491; Ross, 1956:124; Jacquemart, 1965b:36.

*Allochorema tasmanicum*, Neboiss, 1962:530.

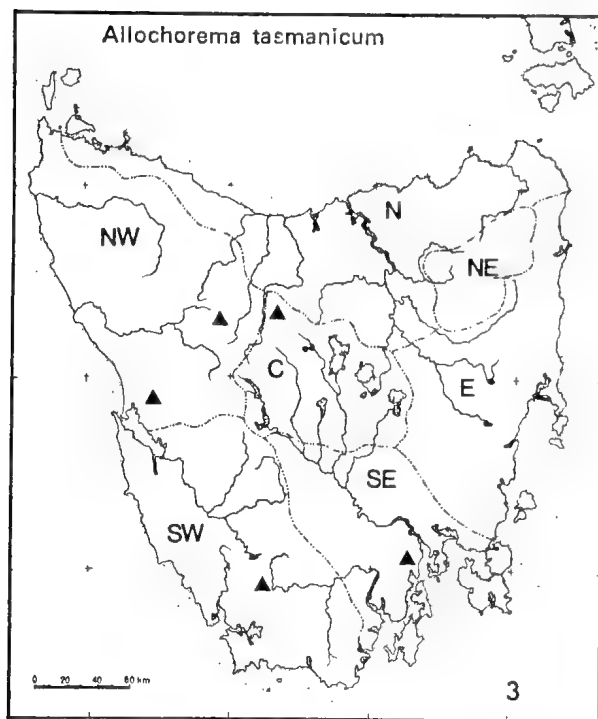


Insect brownish of medium size, wing venation as described in the generic description; the species is distinguished by the male genitalia.

♂ genitalia with segment 10 wide at the base, deeply and roundly excised at the apex, apices covered with short, stout teeth; superior appendages short, stout; inferior appendages large, slightly constricted at distal third, apices dilated and covered with short spines on the inner surface. A short, blunt ventral process on sternite 6.

♀ abdomen terminates bluntly; a pair of small cerci at the apex; strong ridge on sternite 5, which terminates at the anterior margin, but ventrally goes into strong ventral process, which has a few stout spines; ventral process on sternite 7 short.

Length of anterior wing: ♂ 6-7 mm; ♀ 5.5-6.5 mm.



**Type material:** Type ♂ Mt Wellington, Tas. 3000 ft., Dec. 1937, J. W. Evans (BMNH). Type not seen.

**Material Examined:** Tasmania—5 ♂ 4 ♀ Junction Creek, West Arthur Plains, 6 Feb. 1966, A. Neboiss (NMV); 4 ♂ Fisher River, Pencil Pine Grove below Lake Mackenzie dam 15 Dec. 1974, A. Neboiss (NMV); 1 ♂ Dove River, Cradle Mtn. Nat. Park,

14 Dec. 1974, A. Neboiss (NMV); 4 ♂ 1 ♀ 10 mls E Strahan, 6 Feb. 1967, E. F. Riek (ANIC); 1 ♂ same loc. 20 Feb. 1963, I. F. B. Common and M. S. Upton (ANIC).

**Other recorded localities:** Cradle Mtn. (Jacquemart, 1965).

**Distribution:** Tasmania—NW, SW, C and SE provinces.

### Subfamily HYDROBIOSINAE Ulmer (1905)

**Diagnosis:** In females the ridge on sternite 5 terminates at the lateral margin. The larvae with prosternum heavily sclerotized; anterior legs enlarged, chelate; the chela formed by a distal process from the femur articulating with the combined tibia-tarsus-claw.

### Tribe Hydrobiosini

### Genus *Austrochorema* Mosely

*Austrochorema* Mosely in Mosely and Kimmins, 1953:481; Neboiss, 1962:532.

**Type species:** *Austrochorema wenta* Mosely, 1953.

Wing venation similar in both sexes, and discoidal cell open in both wings; anterior wing with forks 1 and 2 long, sessile, others with footstalks; posterior wing with forks 1, 2, 3 and 5 present, all with footstalks. Lateral filament on sternite 5 in males long, with thicker proximal, and thinner, more transparent distal section.

The ridge on sternite 5 in females terminates with a small loop which extends above the lateral margin. Posterior tibia in both sexes covered with long hairs.

Spurs 2:4:4.

In general appearance all species of the genus appear to be very similar, uniformly greyish-brown in colour and of medium size; they are separated on the differences in genitalia structures.

In both, the male and female, genitalia has two basic types. The males with a short coxopodite of the inferior appendage correspondingly has females with short segments 9 and 10. This group is known by six species, all of which, except one, occur only on the Australian mainland, the exception being the endemic Tasmanian species *pegidion*. The other group is characterized by the inferior appendage having a long coxopodite in the male genitalia, and

more elongate dorso-ventrally compressed segments 9 and 10 in the female. All four species known from this group are endemic to Tasmania.

#### KEY TO THE TASMANIAN SPECIES

(Males only)

1. Inferior appendages with harpago shorter than coxopodite . . . . . 2
- Inferior appendages with harpago longer than coxopodite . . . . . *pegidion*
2. Superior appendages about as long as the inferior appendages . . . . . 3
- Superior appendages distinctly shorter than inferior appendages . . . . . *lepnevae*
3. Segment 9 in ventral view with sides gradually curved to slightly incised apex . . . . . *complexa*
- Segment 9 in ventral view abruptly narrowed in upcurved apical section . . . . . 4
4. Segment 9 upcurved terminal section with flattened and bi-pointed, inwardly directed plate . . . . . *evansi*
- Segment 9 with upcurved terminal section, rounded apically . . . . . *crinitum*

#### 4 *Austrochorema pegidion* Neboiss

Figures 23-31

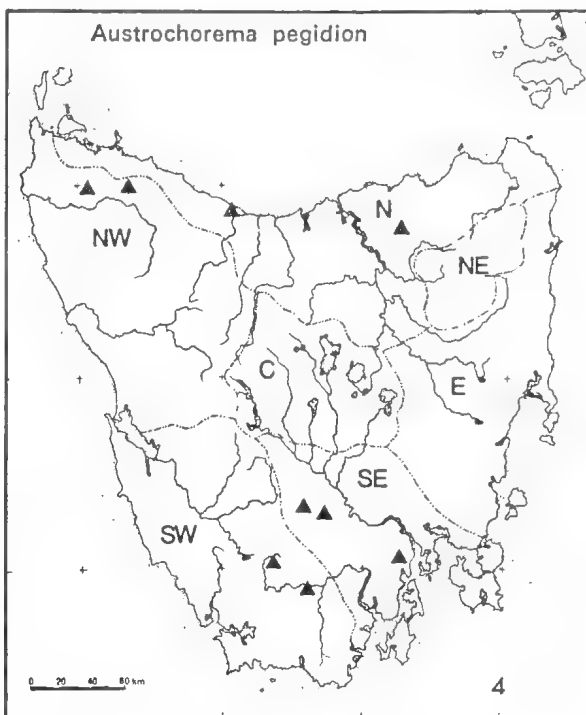
*Austrochorema pegidion* Neboiss, 1962:535

This is the only species which belongs to the group of Australian mainland species as described above.

♂ *genitalia*: segment 10 semi-membranous; below it at the base there is a pair of small, but distinct tubercles, and further down arises a curved, tapered plate, cleft apically. Superior appendages long and slender, curved, apices slightly clavate. Inferior appendages with coxopodite short and broad, ventral margin curved inwards and irregularly dentate; harpago slender, abruptly widened to broad, angular base. Posterior margin of sternite 9 produced to distinct apically rounded, finger-like process. Broad ventral process on sternite 7. Lateral filament on sternite 5 long, directed anteriorly, distal section short.

♀ abdomen terminates bluntly; tergite 8 broadens ventrally; distal angle produced to a rounded lobe; ventral plate triangular.

Length of anterior wing: ♂ 6.5-7.5 mm; ♀ 7-7.5 mm.



*Type material*: Holotype ♂ Broad River nr. Lake Dobson, Mt Field National Park, Tas., 6 Nov. 1955, T. Woodward (QM). Type seen.

*Material examined*: Tasmania—1 ♂ 1 ♀ Russell Falls, National Park, 20 Feb. 1971; 1 ♂ Strickland Ave., Hobart, 22 Feb. 1967; 1 ♂ Condominion Creek, 15 Feb. 1971; 2 ♂ 1 ♀ Ulverstone 4 km NW, small waterfalls, 18 Nov. 1972; 5 ♂ Dip River Falls, 10 km S of Mawbanna, 1 Dec. 1974; 1 ♂ Lilydale, a creek 2 km N, 16 Dec. 1974; 2 ♂ 1 ♀ Duck River 6 km SW of Roger River, 29 Nov. 1974; 2 ♀ Mt Wellington, 8 Dec. 1974; 1 ♂ Port Davey Track, 4 km W of Picton River, 11 Feb. 1966. All specimens collected by A. Neboiss (NMV). 1 ♂ Lake Dobson, 20 Feb. 1967, E. F. Riek (ANIC); 1 ♂ 1 ♀ Russell Falls, 23 Feb. 1967, E. F. Riek (ANIC).

*Distribution*: Tasmania—N, NW, SW and SE provinces.

#### 5 *Austrochorema evansi* (Mosely)

Figures 32-35; 46

*Anachorema evansi* Mosely in Mosely and Kimmins, 1953:460.

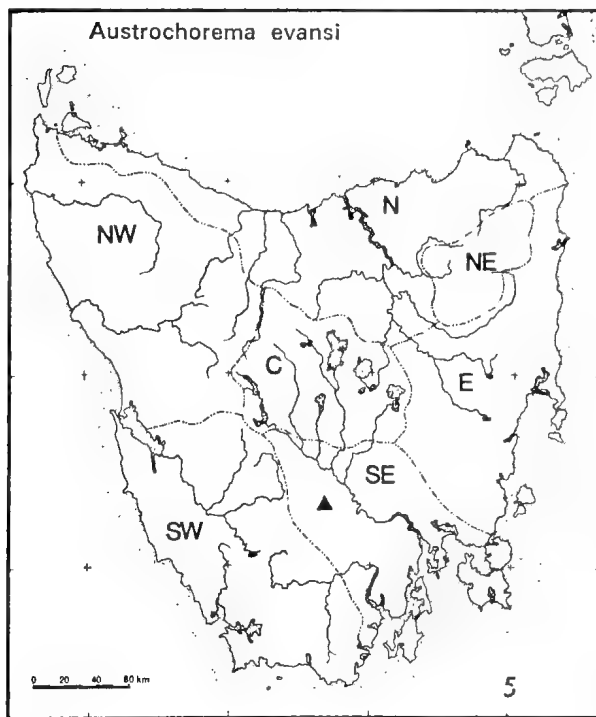
*Austrochorema evansi*, Neboiss, 1962:533.

♂ *genitalia* with segment 10 semi-membranous, of which the lateral margins are more chitinized and covered with stiff hairs

distally. Superior appendages slender, broader at base and slightly dilated apically. Inferior appendages two-segmented; proximal segment long, stout, terminating with a short, inward turned, finger-like process; distal segment in a form of short, blunt claw, curved toward the finger-like process. Phallus stout with asymmetric parameres. Lateral filament on sternite 5 arises from lateral margin and consists of two about equally long sections, the thicker proximal and thinner, transparent distal section.

♀ abdomen in dorsal view terminates in a large, elongate triangular and distally truncate plate; inner structure as figured.

*Length of anterior wing:* ♂ 5.5 mm; ♀ 6 mm.



*Type material:* Type ♂ Tasmania, without exact locality. J. W. Evans (BMNH). Type not seen.

*Material examined:* Tasmania—1 ♂ Russell Falls, Nat. Park, 20 Feb. 1971, A. Neboiss (NMV); 1 ♀ same loc., 23 Feb. 1967, A. Neboiss (NMV); 2 ♂ same loc., 5 Dec. 1972, P. Zwick (NMV).

*Distribution:* Tasmania—SE province.

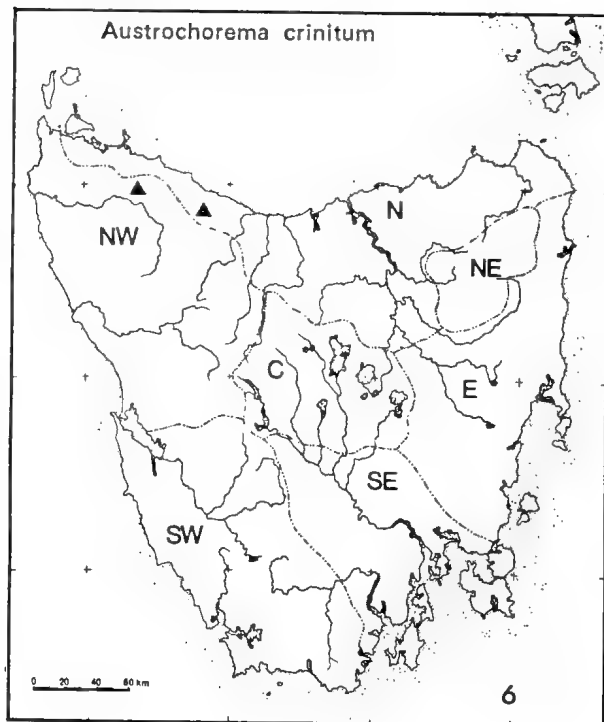
## 6 *Austrochorema crinitum* sp. n.

Figures 36-44

♂ genitalia basically follow the pattern of that in *A. evansi* but differs in detail. Lower lateral margins of segment 5 chitinized distally; on either side of the base of segment 10 arises a curved, pointed process, which midventrally is extended to a small, bipointed plate, visible when genitalia viewed end on. Superior appendages slender, broader at base and slightly dilated apically. Inferior appendages with proximal segment rather robust, broad, the inner distal margin terminating with slightly curved, finger-like process; distal segment short, curved inward towards the process. Phallus with asymmetric parameres. Lateral filament on sternite 5 arises from the middle of lateral margin; consists of two about equally long sections, the thicker proximal and the thinner transparent distal section. Posterior tibia densely covered with long hairs, with no underlying short pubescence.

♀ abdomen with the last three segments distinctly flattened dorso-ventrally.

*Length of anterior wing:* ♂ 5.5 mm; ♀ 5.5 mm.



*Type material:* Holotype ♂ (T4805), allotype ♀ (T4806) Guide River Falls nr. Ridgley, Tas., 18 Nov. 1972, A. Neboiss (NMV); 1 ♂ 2 ♀ paratypes (T4807-T4809) Dip River Falls 10 km S of Mawbanna, Tas., 1 Dec. 1974, A. Neboiss (NMV).

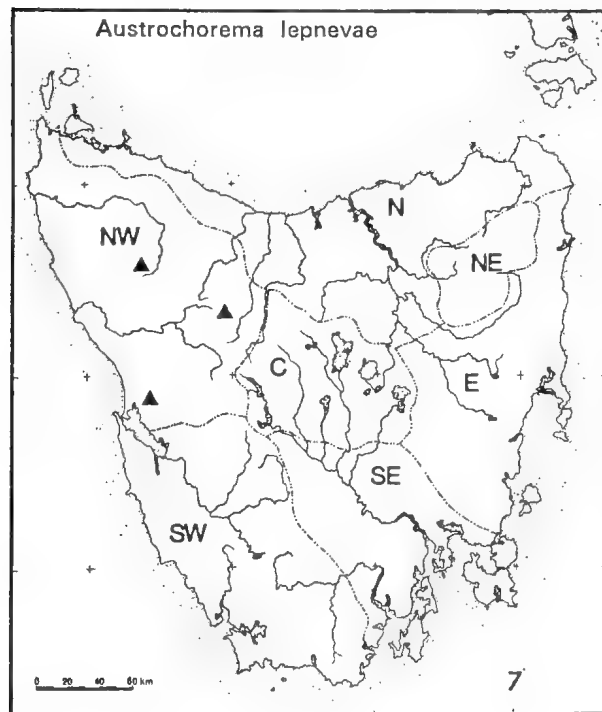
*Distribution:* Tasmania—N and NW provinces.

## 7 *Austrochorema lepnevae* Jacquemart

Figures 47-48

*Austrochorema lepnevae* Jacquemart, 1965b:43.

The type has been dissected and, unfortunately, the parts of genitalia are so distorted that their original position could not be fully reconstructed. Relying on figure 36c of Jacquemart (1965b), the main difference between this species and *crinitum* described above, is in the shape of the process arising on either side of the base of segment 10. In *lepnevae* the upper angle of this process is short and acute, in *crinitum* long and curved. The superior appendages in the original figure of lateral view are not shown. Figure 36d in the same publication is incomplete, as it does not show the thin distal section of the filament on sternite 5.



♀ unknown. A female from Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971, A. Neboiss, is doubtfully referred to this species and illustrated (Fig. 48).

*Length of anterior wing:* ♂ 5.5 mm.

*Type material:* Holotype ♂ Cradle Mtn., Tas., 27 Jan. 1923, A. Tonnoir (IRScNB), dissected and mounted on three microscope slides. Type seen.

No new material has been available for study.

*Distribution:* Tasmania—NW province (known from type locality only).

## 8 *Austrochorema complexa* Jacquemart

Figures 45; 49-53

*Austrochorema complexa* Jacquemart, 1965b:41.

♂ genitalia with segment 10 broad, somewhat rectangular, lower lateral margins terminating into a curved point; at the base below segment 10 there is a chitinous plate which ends in several processes as shown in the drawing. Superior appendage slender, about as long as segment 10. Inferior appendage slender, coxopodite long, with small finger-like process at the inner apical margin; harpago short, robust, slightly curved inward. Lateral filament on sternite 5 long, directed anteriorly; thin, transparent distal section short, curved. Posterior tibia covered with sparse long hairs and dense cover of short pubescence.

The figures and description are prepared from a Lake Pedder specimen.

♀ unknown.

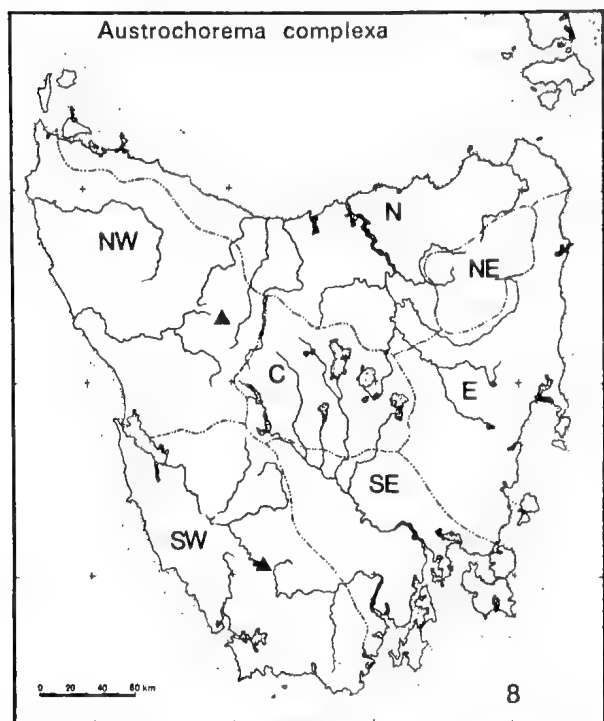
*Length of anterior wing:* ♂ 6 mm.

*Type material:* Holotype ♂, Cradle Mtn. Tas., 10 Jan. 1923, A. Tonnoir (IRScNB). Two male specimens have been used for the description, which were mounted on 8 microscope slides without indication which part belongs to which specimen. The one abdomen, with the genitalia intact, is labelled 'Holotype'. Type seen.

*Material examined:* Tasmania—1 ♂ Lake Pedder, 10 Mar. 1972, A. Neboiss (NMV).

*Distribution:* Tasmania—NW and SW provinces.





Genus *Ipsobiosis* gen. n.

*Type species: Ipsobiosis spicula* gen. et sp. n.

This genus occupies a position between *Austrochorema* and *Ulmerochorema*. There are some characteristics from one or the other genus, particularly in the wing venation; however, their combination supported by details of other structures warranted separation.

Anterior wing with Rs forked apically; forks 1, 2, 3, 4 and 5 present; forks 1 and 2 very long; fork 3 shorter than fork 4, which is about as long as fork 5; discoidal cell open in male, usually closed in female; a long bristle on anal margin in male. Posterior wing with forks 1, 2, 3 and 5 present, fork 2 with very short foot-stalk, discoidal cell open. Lateral filament on sternite 5 in the male present.

Spurs 2:4:4.

9 *Ipsobiosis spicula* sp. n.

Figures 54-61

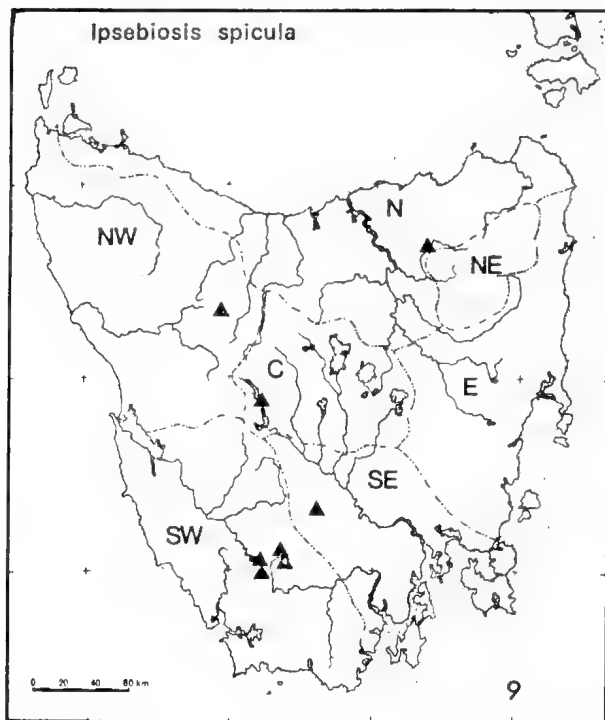
Moderately large species with mottled brown and yellowish wings. A rounded patch of short, vertical rods on the upper surface of posterior wing in male.

♂ *genitalia*: segment 10 semi-membranous, elongate, gradually narrowed distally, small,

rounded chitinized lateral flaps near the apex, on either side at the base an elongate claw-like process. Superior appendages long and slender. Inferior appendages 2-segmented, coxopodite long, harpago short, apically rounded with small, acute projection at the inner apical margin. Two long, upward directed and curved processes arise from the lower inner margin of segment 9. Short, broad, laterally flattened and apically hooked lateral filament arises from the lateral margin of sternite 5.

♀ abdomen terminates bluntly, segment 9 with distinct, rounded lateral flaps; ventral processes on segments 5 and 6, a fringe of long hairs along the posterior margin of sternite 7.

*Length of anterior wing*: ♂ 8.5-9 mm; ♀ 9-9.5 mm.



*Type material*: Holotype ♂ (T4810), allotype ♀ (T4811) Lake Dobson, Tas., 20 Feb. 1967, A. Neboiss (NMV); 15 paratypes—1 ♂ 1 ♀ (T4812-T4813) Waldheim, Cradle Mtn. Nat. Park, Tas., 7 Feb. 1971, A. Neboiss (NMV); 1 ♂ (T 4814) Lake Pedder, Tas., 1 Feb. 1965, A. Neboiss (NMV); 1 ♂ (T4815) Condominion Creek, Tas., 15 Feb. 1971, A. Neboiss (NMV); 1 ♂ (T4816) St. Patricks River, Targa, Tas., 22 Feb. 1971, A. Neboiss



(NMV); 1 ♀ (T4817) Huon Plains nr. Scotts Peak, Tas., 2 Feb. 1965, A. Neboiss (NMV); 1 ♀ (T4818) Huon River Crossing, Tas., 16 Feb. 1971, A. Neboiss (NMV); 1 ♀ (T4819) Derwent River 2 km NW Derwent Bridge, Tas., 12 Feb. 1971, A. Neboiss (NMV); 2 ♂ Lake Dobson, Tas., 20 Feb. 1967, E. F. Riek (ANIC); 1 ♂ Derwent Bridge, Tas., 12 Feb. 1967, E. F. Riek (ANIC); 2 ♂ 10 mls E Strahan, Tas., 20 Feb. 1963, I. F. B. Common and M. S. Upton (ANIC; NMV); 1 ♂ 1 ♀ 3 mls E Waratah, Tas., 17 Feb. 1963, I. F. B. Common and M. S. Upton (ANIC).

*Distribution:* Tasmania—N, C, NW, SE and SW provinces.

### Genus *Ulmerochorema* Mosely

*Ulmerochorema* Mosely in Mosely and Kimmins, 1953:432; Ross, 1956:124; Neboiss, 1962:538.

*Anachorema* Mosely in Mosely and Kimmins, 1953:453.

*Type species:* *Hydrobiosis stigma* Ulmer, 1916.

Anterior wing with discoidal cell closed; forks 1, 2, 3, 4 and 5 present, forks 1 and 2 sessile, others with footstalk. Posterior wing with discoidal cell open, forks 1, 2, 3 and 5 present, fork 1 either sessile or with short footstalk, others with footstalk. Lateral filament on sternite 5 in male arising from the lateral margin; posterior margin of segment 9 usually with long, bifurcate process. In female often a dark, circular patch consisting of a mass of dark hairs located near the apex of posterior wing; abdomen terminates bluntly; lateral pockets formed between segments 8 and 9, and sometimes covered with short setae.

Spurs 1:4:4.

Of the six species known to occur in Tasmania, three appear to be endemic. The general appearance of specimens, particularly of those preserved in alcohol, is so similar, that no description of colour is included.

### KEY TO THE TASMANIAN SPECIES

1. Fork 2 in posterior wing longer than its footstalk . . . . . *breve*
- Fork 2 in posterior wing shorter than its footstalk . . . . . 2
2. Fork 1 in posterior wing with short footstalk . . . . . 3

- Fork 1 in posterior wing sessile . . . . 4
3. Male genitalia with lateral plates of segment 10 broad, distal margin with 3 to 4 claw-like extensions; in female a pair of dark, roof-like plates meso-ventrally on segment 10 . . . . . *onychion*
- Male genitalia with lateral plates of segment 10 pointed, upcurved distally; in female no dark, roof-like plates meso-ventrally on segment 10 . . . . . *lentum*
4. Fork 1 in posterior wing broad at base . . . . . *seona*
- Fork 1 in posterior wing tapered to a point at base . . . . . 5
5. In male genitalia the inferior appendage with both apical branches of approximately the same size; female-lateral pockets between segments 8 and 9 deep . . . . . *rubiconum*
- In male genitalia the inferior appendage with upper apical branch smaller than the lower; female-lateral pockets between segments 8 and 9 shallow . . . . *tasmanicum*

### 10 *Ulmerochorema breve* (Mosely)

Figures 62-66

*Anachorema brevis* Mosely in Mosely and Kimmins, 1953:456; Jacquemart, 1965b:36.

*Ulmerochorema breve*, Neboiss, 1962:539.

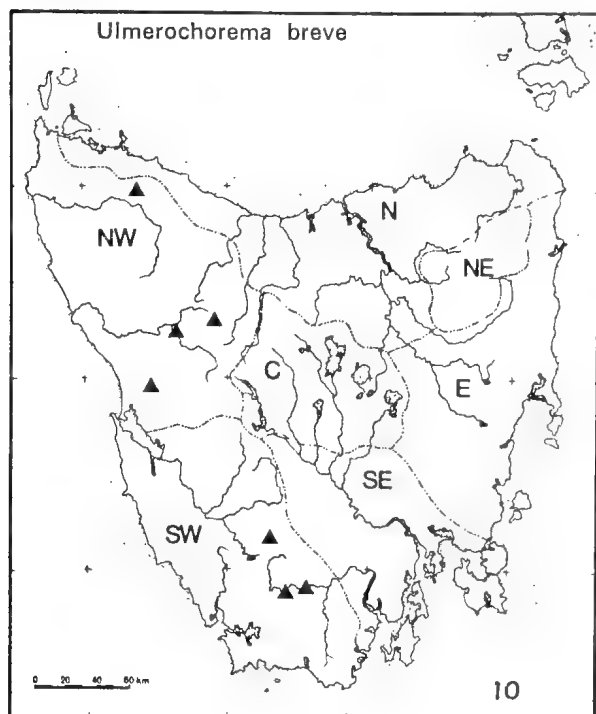
The wing venation differs from other species of the genus by the long fork 2 in posterior wing, the footstalk being only one quarter of the length of the fork.

♂ genitalia—segment 10 broad at base, curved gradually towards the apex, lateral margins fringed with fine hairs, at the base on either side a pair of acutely pointed lobes; superior appendages long and slender; inferior appendages broad, tri-lobed distally, the upper lobe broad, obliquely truncate, the other two slender. A long, upcurved process arises from the mid-posterior margin of sternite 9, divided nearly to the base into two branches, each with a smaller, pointed lateral branch arising about midway and directed distally. Lateral filament on sternite 5 short, apex rounded. Ventral processes absent.

♀ wing venation similar to that in ♂, but

posterior wing with circular patch of dark hairs on lower surface of posterior wing between forks 1 and 3.

Length of anterior wing: ♂ 7 mm; ♀ 7 mm.



*Type material:* Type ♂, Cradle Mtn. Tas., 18 Jan. 1917, R. J. Tillyard (BMNH). Type not seen.

*Material examined:* Tasmania—2 ♂ Cracroft River, 8 Feb. 1966, A. Neboiss (NMV); 1 ♂ Henty River 12 km NW Queenstown, 10 Feb. 1971, A. Neboiss (NMV); 1 ♀ Huon River nr. Blakes Opening, 9 Feb. 1966, A. Neboiss (NMV); 6 ♂ 4 ♀ Dip River Falls 10 km S of Mawbanna, 1 Dec. 1974, A. Neboiss (NMV); 1 ♂ Wedge River 30 mls W Maydena, 25 Feb. 1967, E. F. Riek (ANIC); 3 ♂ Murchison River, 5 Feb. 1967, E. F. Riek (ANIC).

*Distribution:* Tasmania—NW and SW provinces.

# 11 *Ulmerochorema seona* (Mosely)

Figures 67-69

*Anachorema seona* Mosely in Mosely and Kimmins, 1953:458.

*Ulmerochorema seona*, Neboiss, 1962:545.

*Anachorema seona* (sic!) Kimmins, Jacquemart, 1965b:3, 37 (misspelling and wrong author).

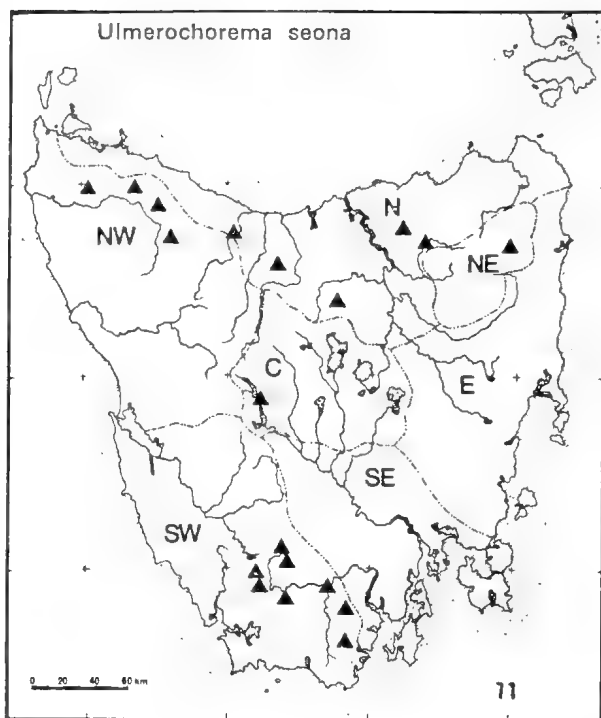
It is the only species of this genus with fork 1 in the posterior wing broadly sessile; in females always, but occasionally also in males, there is an oval thickening of the wing mem-

brane between the base of fork 1 and footstalk of fork 2.

♂ genitalia with lateral process arising below the base of segment 10 gradually tapering to slightly upcurved apex; superior appendages long and slender; inferior appendages two-segmented, proximal segment long, curved, terminating with inwardly directed acute point, distal segment short, obliquely truncate. From the centre of sternite 9 arise two long, slightly curved spines, which sometime show very fine dentation on ventral surface.

♀ abdomen terminates in blunt, rounded apex; lateral pockets between segments 8 and 9 small, covered with fine setae.

Length of anterior wing: ♂ 5-7.5 mm; ♀ 6-8 mm.



*Type material:* Type ♂ River Ouse, Tas., 4 Feb. 1933, R. J. Tillyard (BMNH). Type seen.

*Material examined:* Tasmania—29 ♂ 19 ♀ Derwent River 2 km NW Derwent Bridge, 12 Feb. 1971; 10 ♂ 9 ♀ St. Patricks River, Targa, 22 Feb. 1971; 1 ♂ Leven River nr. Heka, 17 Nov. 1972; 1 ♂ St. Columba Falls, Pyengana, 21 Feb. 1971; 1 ♂ Minnow River nr. Paradise, 17 Nov. 1972; 2 ♂ 3 ♀ Hellyer River Gorge, 5 Nov. 1972; 8 ♂ 7 ♀ 12 Dec. 1974; 2 ♀ Flowerdale River nr. Meuna, 4 Nov. 1972; 3 ♂ Huon-Picton River junction, 18 Feb. 1967; 6 ♂ same loc., 15 Nov.

1972; 6 ♂ 11 ♀ Huon River nr. Scotts Peak, 9 Feb. 1965; 1 ♀ Huon River Crossing, 16 Feb. 1971; 1 ♂ Cracroft River, 8 Feb. 1966; 1 ♂ 1 ♀ Arve River, 10 km W Geeveston, 19 Feb. 1967; 2 ♂ Hot Springs Creek nr. Hastings Caves, 14 Nov. 1972; 16 ♂ 4 ♀ Duck River 6 km SW of Roger River, 29 Nov. 1974; 9 ♂ Lilydale, creek 2 km N, 16 Dec. 1974; 1 ♂ 3 ♀ Quamby Brook 1 km E of Golden Valley, 16 Dec. 1974; 1 ♀ Arthur Plains, Junction Creek, 3 Feb. 1965; 1 ♀ Condominion Creek nr. Mt Anne, 9 Feb. 1965; 13 ♂ 16 ♀ Dip River Falls 10 km S of Mawbanna, 1 Dec. 1974. All specimens collected by A. Neboiss (NMV). 11 ♂ 4 ♀ Hellyer Gorge, 4 Feb. 1967, E. F. Riek (ANIC); 2 ♀ Huon-Picton River junction, 17 Feb. 1967, E. F. Riek (ANIC).

*Other recorded localities:* Derwent River.

*Distribution:* Tasmania—all provinces except E province; New South Wales; Victoria.

## 12 *Ulmerochorema lentum* Neboiss

Figures 70-72

*Ulmerochorema lentum* Neboiss, 1962:539.

In posterior wing fork 1 with short footstalk; in females, although there is no definite circular patch, some dark hairs are present on the underside of the wing between forks 1 and 3. Lateral filament on sternite 5 in male short.

♂ *genitalia*: segment 10 broad at base, from about the middle gradually tapered to a narrow, rounded apex; below the segment arise a pair of plates, broad at base, upcurved distally, tapering to acute point. Superior appendages slender, slightly dilated distally. Phallus slender with fringed, obliquely twisted apex. Inferior appendages laterally somewhat flattened, proximal two-thirds broad, distal one-third narrow, small finger-like process on the inside near the distal end. The posterior margin of sternite 9 in the middle with a pair of small protuberances only.

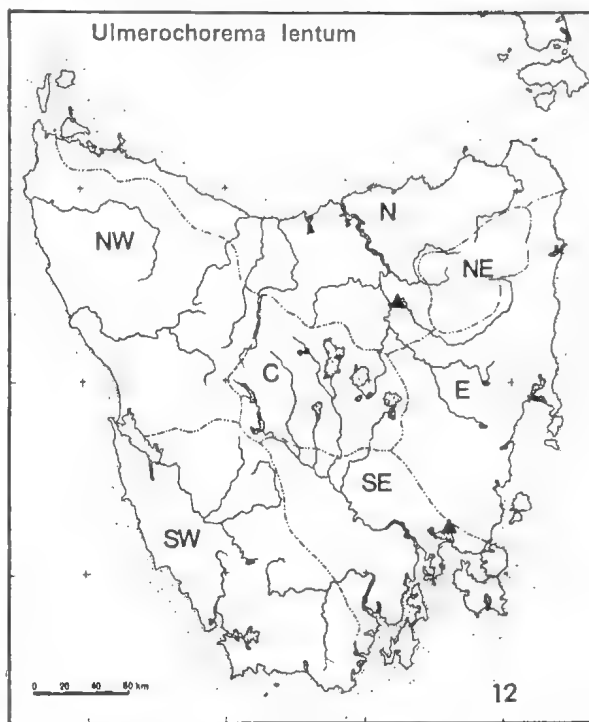
♀ abdomen terminates bluntly; lateral pockets between segments 8 and 9 short.

*Length of anterior wing*: ♂ 8 mm; ♀ 8-9 mm.

*Type material*: Holotype ♂, allotype ♀, Clunes, Vic., 9 Jul. 1953 ex pupa 12 Jul. 1953, A. Neboiss (ANIC). Type seen.

*Material examined*: Tasmania—2 ♂ 17 ♀ South Esk River nr. Evandale, 1 Mar. 1967, A. Neboiss (NMV). 1 ♂ Sorell River 3 km N of Sorell, 8 Dec. 1974, A. Neboiss (NMV).

*Distribution*: Tasmania—N and SE provinces; New South Wales; Victoria.



## 13 *Ulmerochorema onychion* sp. n.

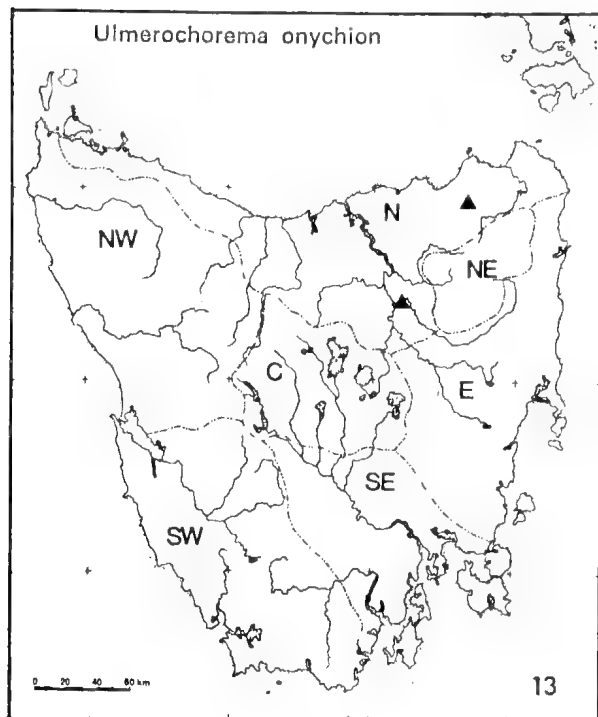
Figures 73-79

Anterior wings dark brown with mottled appearance; in posterior wing fork 1 with short footstalk. The male with lateral filament on sternite 5 present; the inside of front tibia covered with a row of short spines, spur often very small. The posterior wing in female with some dark hairs present between forks 1 and 3, but there is no definite circular patch.

♂ *genitalia*: segment 10 semi-membranous, short, apically truncate, on either side with strongly chitinated, large, downturned hook, below that is a transverse plate with finely dentate lower margin and a large, four-pronged claw laterally; an upcurved, finger-like process just inward from superior appendage which is long and slender. The larger proximal section of inferior appendage as well as posterior part of sternite 9 densely covered with long, heavy, dark hairs; the smaller distal section consists of two flat plates, lying close to each other, the lower one terminating with inwardly directed acute corner. A pair of slender, upward directed processes arise from the middle of posterior margin of sternite 9.

♀ abdomen terminates bluntly, ventral plate broadly truncate; meso-ventral surface of segment 10 with a pair of roof-like, dark, squarish plates.

Length of anterior wing: ♂ 6-7.5 mm; ♀ 6.5-8 mm.



**Type material:** Holotype ♂ (T4820), allotype ♀ (T4821), 15 ♂ 15 ♀ paratypes (T4822-T4851), South Esk River nr. Evandale, Tas., 1 Mar. 1967, A. Neboiss (NMV); 10 ♂ 5 ♀ paratypes Evandale, Tas., 1 Mar. 1967, E. F. Riek (ANIC).

**Other material examined:** Tasmania—79 ♂ 35 ♀ South Esk River nr. Evandale, 1 Mar. 1967, A. Neboiss (NMV); 2 ♂ Great Forester River 5 km NW Forester, 11 Nov. 1972, A. Neboiss (NMV); Victoria—57 ♂ 5 ♀ Goulburn River 5 km N of Yea, 22 Apr. 1972, A. Neboiss (NMV); 2 ♂ 3 ♀ Latrobe Riv. Vic., Stuckey's Bridge nr. Morwell, 31 Oct. 1973, C. McCubbin (NMV); 10 ♂ 10 ♀ Thomson River nr. Tinamba, 12 Feb. 1973, C. McCubbin (NMV).

**Distribution:** Tasmania—N province; Victoria.

#### 14 *Ulmerochorema tasmanicum* (Mosely)

Figures 80-81

*Anachorema tasmanica* Mosely in Mosely and Kimmins, 1953:453.

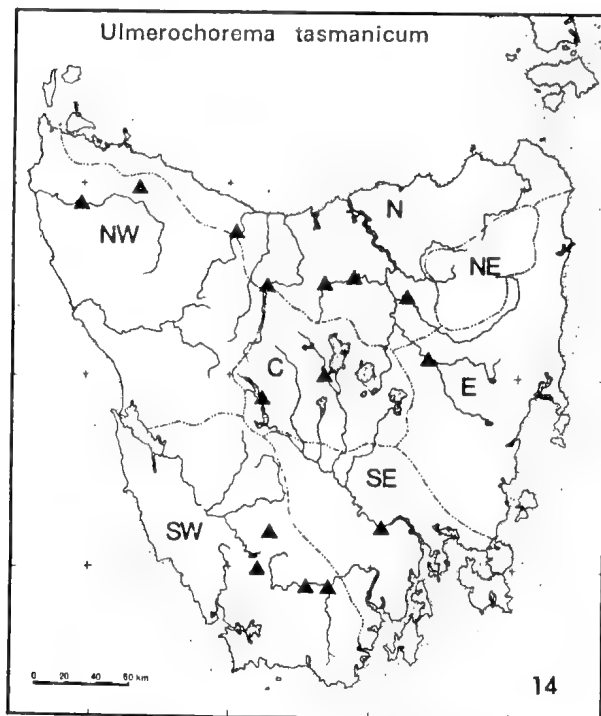
*Ulmerochorema tasmanicum*, Neboiss, 1962:543.

Anterior wings blackish-brown in colour; posterior wings with fork 1 sessile, but not as broadly as in *U. seona*; in female a distinct circular patch of dark hairs between forks 1 and 3. The lateral filament on sternite 5 in male present.

♂ genitalia rather slender. The plate at the base of segment 10 with inner margin produced in small, rounded process; the lower margin of the plate as seen from the side, is produced downward in a triangular keel. Inferior appendage very long, curving slightly upward, with middle section of the inner surface widened and covered with short spines. Centre of the apical margin of sternite 9 produced into a long, bifurcate spine. Phallus straight, membranous, with a pair of heavily fringed, downward curved plates.

♀ abdomen terminates bluntly, but ventral plate narrow and more elongate than in *U. lentum*.

Length of anterior wing: ♂ 6-8 mm; ♀ 6.5-8.5 mm.



**Type material:** Type ♂ New Norfolk, Tas., Mar. 1938, J. W. Evans (BMNH). Type seen.

**Material examined:** Tasmania—1 ♂ Derwent River 2 km NW Derwent Bridge, 12 Feb. 1971; 4 ♂ 4 ♀

South Esk River nr. Evandale, 1 Mar. 1967; 1 ♂ Mersey River, Liena, 16 Nov. 1972; 3 ♂ Leven River nr. Heka, 17 Nov. 1972; 3 ♀ Macquarie River 8 km W Campbell Town, 9 Nov. 1972; 185 ♂ 153 ♀ Huon-Picton River junction, 18 Feb. 1967, 3 ♂ same loc., 15 Nov. 1972; 5 ♂ 4 ♀ Huon River nr. Blakes Opening, 9 Feb. 1966; 2 ♀ Huon River nr. Scotts Peak, 9 Feb. 1965; 3 ♂ Wedge River, 17 Feb. 1971; 1 ♂ Meander River, Deloraine, 28 Nov. 1974; 2 ♂ Meander River 3 km N of Westbury, 16 Dec. 1974; 1 ♂ Arthur River bridge 15 km SW of Roger River, 29 Nov. 1974; 8 ♂ 3 ♀ Dip River Falls, 1 Dec. 1974; 1 ♂ 2 ♀ Derwent River 3 km W of New Norfolk, 7 Dec. 1974. All specimens collected by A. Neboiss (NMV), 13 ♂ 5 ♀ Huon-Picton River junction, 17 Feb. 1967, E. F. Riek (ANIC); 1 ♂ 1 ♀ Evandale, 1 Mar. 1967, E. F. Riek (ANIC).

*Other recorded localities:* Ouse River nr. Great Lake.

*Distribution:* Tasmania—N, NW, SW, C, E and SE provinces.

## 15 *Ulmerochorema rubiconum* Neboiss

Figure 82

*Ulmerochorema rubiconum* Neboiss, 1962:542.

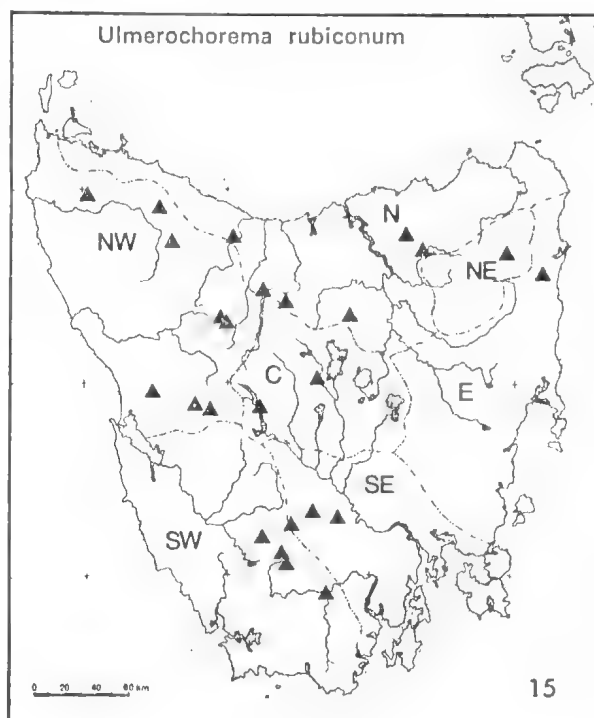
General appearance, colour and wing venation similar to that of *U. tasmanicum*, but can be separated by the differences in the male and female genitalia.

♂ *genitalia*: below segment 10 there are two processes on either side, the dorsal one longer, depressed laterally, slightly produced downward at apex; the ventral process shorter and pointed. Superior appendage slender, about as long as inferior appendage, distal end slightly dilated. Inferior appendage with the larger proximal section broad, narrowed distally and terminating with curved edge. Ventral process arising from the middle of posterior margin of sternite 9, flattened dorso-ventrally, bifurcate at apex, tapering to pointed apex. Heavily fringed plate below phallus.

♀ abdomen terminates bluntly; lateral pockets short and rounded, covered with short setae; ventral plate with distinct transversal ridge.

*Length of anterior wing:* ♂ 7-9 mm; ♀ 8-10 mm.

*Type material:* Holotype ♂, allotype ♀ Rubicon, Vic. 15 Dec. 1955 ex pupa 2 Jan. 1956 and 4 Jan. 1956 respectively, A. Neboiss (ANIC). Type seen.



*Material examined:* Tasmania—55 ♂ 78 ♀ St. Columba Falls, Pyengana, 21 Feb. 1971; 8 ♂ 3 ♀ Scamander River, Upper Scamander, 9 Nov. 1972; 15 ♂ 1 ♀ St. Patrick's River, Targa, 22 Feb. 1971; 29 ♂ 13 ♀ Derwent River 2 km NW Derwent Bridge, 7 Nov. 1972; 13 ♂ 2 ♀ Franklin River 20 km SW Derwent Bridge, 20 Feb. 1971; 4 ♂ 4 ♀ Flowerdale River, Meunna, 4 Nov. 1972; 12 ♂ 8 ♀ Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971; 22 ♂ 11 ♀ Hellyer River Gorge, 9 Feb. 1971; 2 ♂ 15 ♀ same loc., 12 Dec. 1974; 12 ♂ 12 ♀ Mersey River, Liena, 16 Nov. 1972; 29 ♂ 10 ♀ Leven River, Heka, 17 Nov. 1972; 4 ♂ 10 ♀ Russell Falls, Nat. Park, 15 Nov. 1972; 1 ♂ 1 ♀ Lake Dobson, 20 Feb. 1967; 2 ♂ Henty River 12 km NW Queenstown, 10 Feb. 1971; 14 ♂ Huon-Picton River junction, 18 Feb. 1967; 2 ♂ 1 ♀ same loc. 15 Nov. 1972; 1 ♂ Huon River Crossing, 16 Feb. 1971; 4 ♂ 1 ♀ Condominion Creek, 15 Feb. 1971; 7 ♂ Wedge River, 17 Feb. 1971; 1 ♂ 1 ♀ 10 mls W of Maydena, 25 Feb. 1967; 1 ♂ Ouse River 5 mls W of Miena, 28 Feb. 1967; 1 ♂ Duck River 6 km SW of Roger River, 29 Nov. 1974; 3 ♂ 1 ♀ Lilydale, creek 2 km N, 16 Dec. 1974; 3 ♂ 4 ♀ Dove River, Cradle Mtn. Nat. Park, 14 Dec. 1974; 3 ♂ 2 ♀ nr Marakoopa Caves, 15 Dec. 1974; 2 ♂ 4 ♀ Liffey River 5 km W of Liffey, 2 Dec. 1974; 8 ♂ 86 ♀ Collingwood River Bridge, Lyell h-way, 9 Dec. 1974. All specimens collected by A. Neboiss (NMV).

*Other recorded localities:* Ouse River nr. Great Lake; Derwent River.

*Distribution:* Tasmania—all provinces; New South Wales; Victoria.

Genus *Ethochorema* gen. n.

Type species; *Taschorema nesydrion* Neboiss, 1962.

This genus has been erected to take a group of species previously included in genus *Taschorema* and having fork 1 with footstalk in the anterior wing. At present seven species *ochraceum*, *brunneum*, *turbidum*, *nesydrion*, *hesperium*, *secutum* and *kelion* are included, of which the two latter ones are described as new. Three species are known from Tasmania and they all appear to be endemic.

Anterior wing with Rs forked apically, forks 1, 2, 3, 4 and 5 present; fork 1 with footstalk, fork 2 sessile, forks 3, 4 and 5 with footstalks; discoidal cell closed, elongate, moderately long, some species with a pair of long bristles on the anal margin. Posterior wing with Sc and R<sub>1</sub> ending separately at the wing margin; forks 1, 2, 3 and 5 present, fork 2 sessile, others with footstalks; discoidal cell open; in males a narrow, elongate cell-like structure between Cu<sub>2</sub> and A<sub>1</sub>, androconia on A<sub>2</sub> and A<sub>3</sub> either present or absent, depending on species. Lateral filament on sternite 5 present in male; the ridge on sternite 5 in female terminates at lateral margin.

Spurs 2:4:4.

## KEY FOR SEPARATING THE SPECIES

(Males only)

1. Posterior wings with cell-like structure between Cu<sub>2</sub>-A<sub>1</sub> present . . . . . 2
- Posterior wings without cell-like structure . . . . . *secutum*
2. Anterior wing with footstalk of fork 1 short . . . . . 3
- Anterior wing with footstalk of fork 1 long, at least 3 times longer than cross-vein closing discoidal cell . . . . . 4
3. In male the anal margin of anterior wing with two long bristles; cell-like structure in posterior wing large (Vic.) *hesperium*
- In male the anal margin of anterior wing without bristles; cell-like structure in posterior wing small . . . . . (Tas.) *kelion*
4. Anterior wing with costal fold . . . . . 5
- Anterior wing without costal fold . . . . . 6

5. Ventral process on segment 6 larger than the short and blunt process on segment 7 . . (Qld., N.S.W.) *ochraceum*
- Ventral process on segment 6 absent, process on segment 7 slender, acutely pointed . . . . . (Tas.) *nesydrion*
6. The processes on either side of phallus without lateral spines . . . . . (Qld., N.S.W., Vic.) *brunneum*
- The processes on either side of phallus with one large and several small lateral spines . . . . . (N.S.W., Vic.) *turbidum*

16 *Ethochorema secutum* sp. n.

Figures 83-85

Anterior wings brown, unicolorous; males with long fold along C-Sc extending to almost the full length of the wing, densely covered with long hairs; anal margin without a pair of long bristles. Posterior wings without cell-like structure between Cu<sub>2</sub> and A<sub>1</sub> and without androconia.

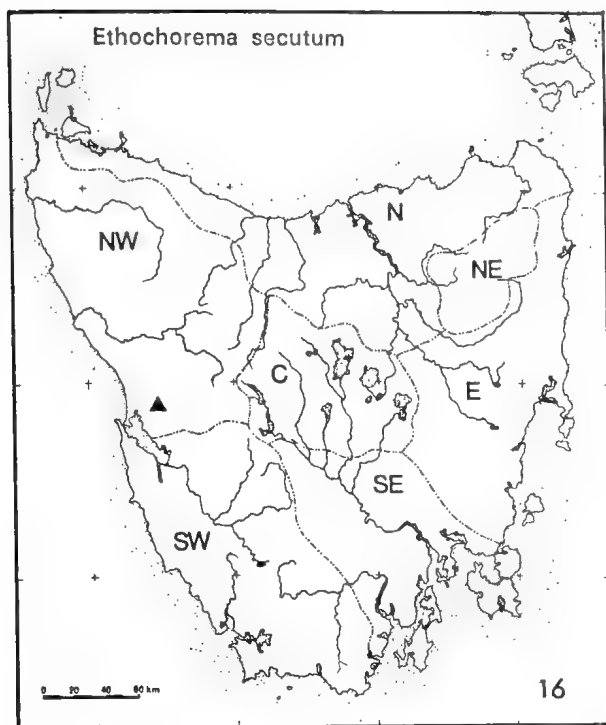
♂ genitalia with segment 9 narrow dorsally; segment 10 broad, parallel-sided, somewhat truncate apically, on either side at the base a pair of short, apically rounded processes. Superior appendages slender. Phallus membranous, bearing two groups of outwards directed spines at apex, and a pair of dark, strongly sclerotized plates mesally. Inferior appendages gradually curved inwards, slightly widened basally; a pair of finger-like processes arising from mesal plate, each bearing a small, acute tubercle on ventral margin near the apex. Lateral filament on sternite 5 short, apex rounded; there are no ventral processes on either sternite 6 or 7.

♀ unknown.

Length of anterior wing: ♂ 8.5-9 mm.

Type material: Holotype ♂ 10 mls E of Strahan, 6 Feb. 1967, E. F. Riek (ANIC); 3 ♂ paratypes and 1 ♂ pupa (fully developed), same date (ANIC; NMV—T5136, T5595); 6 ♂ same loc. 20 Feb. 1963, I. F. B. Common and M. S. Upton (ANIC; NMV—T5137, T5138).

Distribution: Tasmania—NW province.



17 *Ethochorema nesydrion* (Neboiss)

Figures 86-95

*Taschorema nesydrion* Neboiss, 1962:562.

Originally described from a single female, this species has been found to be rather common and occurs throughout Tasmania; it is not known from the Australian mainland.

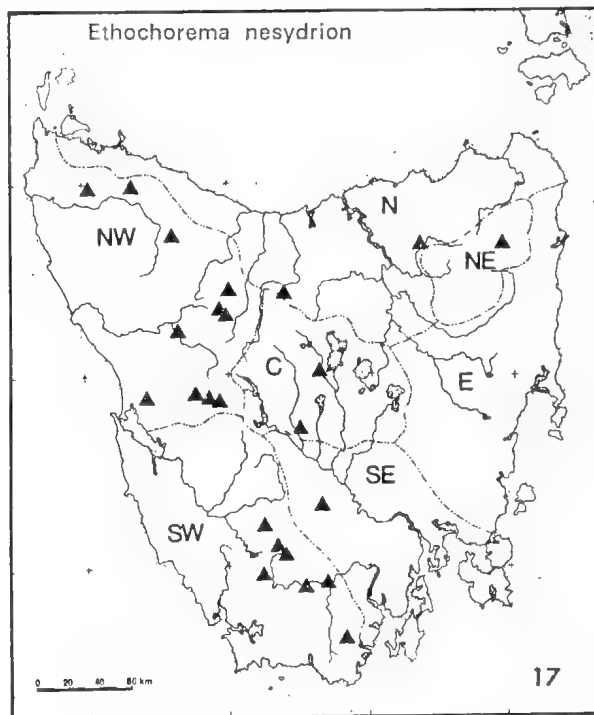
The mid-anterior wart on the head divided with central line. Anterior wing in the male with C-Sc folded and covered with dense, long hairs on the upper surface, anal margin without the pair of long bristles; posterior wing with cell-like structure small.

♂ genitalia with segment 10 semi-membranous, slender, viewed from above, narrow, parallel-sided, apex rounded, cleft at the centre; at the base on either side a slender, finger-like process. Superior appendages moderately long, slender, slightly shorter than inferior appendages; on either side of phallus a small, finger-like process; inferior appendages with apex dorso-ventrally compressed and club-shaped, base widened inwardly into a large lobe, which is covered with short, peglike spines on the inner surface; midventrally a large spatulate

process. Phallus robust, curved downwards. Lateral filament on sternite 5 with apex rounded; a small, acutely pointed, ventral process on sternite 7.

♀ abdomen with fringe of long hairs along posterior margin of sternite 7; a small, acutely pointed, ventral process on sternite 6.

Length of anterior wing: ♂ 8-9.5 mm; ♀ 8-10.5 mm.



Type material: Holotype ♀ Cradle Mtn., Tas., 16 Jan. 1917, R. J. Tillyard (BMNH). Type seen.

Material examined: Tasmania—10 ♂ 12 ♀ Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971; 3 ♂ 10 ♀ Hellyer River Gorge, 9 Feb. 1971; 7 ♂ 12 ♀ same loc., 12 Dec. 1974; 1 ♂ 1 ♀ Ouse River 5 mls W of Miena, 28 Feb. 1967; 1 ♂ St. Patricks River nr. Targa, 22 Feb. 1971; 7 ♀ St. Columba Falls, Pyengana, 21 Feb. 1971; 1 ♂ 5 km W of Bronte, 8 Nov. 1972; 1 ♂ 6 ♀ Franklin River 20 km SW Derwent Bridge, 11 Feb. 1971; 22 ♂ 19 ♀ Huon-Picton River junction, 18 Feb. 1967; 1 ♂ same loc., 15 Nov. 1972; 4 ♀ Huon River Crossing, 15 Feb. 1972; 1 ♂ 1 ♀ Huon River nr. Blakes Opening, 9 Feb. 1966; 1 ♂ West Arthur Plains, 6 Feb. 1965; 2 ♂ Junction Creek, West Arthur Plains, 7 Feb. 1966; 2 ♂ Wedge River, 17 Feb. 1972; 11 ♂ 4 ♀ Condominion Creek, 15 Feb. 1971; 1 ♂ 1 ♀ Hot Springs Creek nr. Hastings Caves, 14 Nov. 1972; 3 ♂ 1 ♀ Dove River, Cradle Mtn. Nat. Park, 14 Dec. 1974; 1 ♀ nr. Marakoopa Caves, 15 Dec. 1974; 1 ♀



Iris River tributary 15 km N of Cradle Mtn., 13 Dec. 1974; 1 ♂ 10 ♀ Duck River 6 km SW of Roger River, 29 Nov. 1974; 6 ♂ 2 ♀ Dip River Falls 10 km S of Mawbanna, 29 Nov. 1974; 2 ♀ Collingwood River bridge, Lyell h-way, 9 Dec. 1974; 1 ♀ Arrowsmith Creek, 18 km SW Derwent Bridge, 9 Dec. 1974. All above specimens collected by A. Neboiss (NMV); 1 ♂ 1 ♀ Franklin River, 10 Feb. 1967, E. F. Riek (ANIC); 7 ♂ 6 ♀ Hellyer Gorge, 4 Feb. 1967, E. F. Riek (ANIC); 1 ♂ 2 ♀ Murchison River, 5 Feb. 1967, E. F. Riek (ANIC); 1 ♀ Lake Dobson, 20 Feb. 1967, E. F. Riek (ANIC); 1 ♂ 10 mls E Strahan, 6 Feb. 1967, E. F. Riek (ANIC); 1 ♂ Pyengana West, 1000 ft., 2 Mar. 1963, I. F. B. Common and M. S. Upton (ANIC).

**Distribution:** Tasmania—all provinces except E province.

### 18 *Ethochorema kelion* sp. n.

Figures 96-98

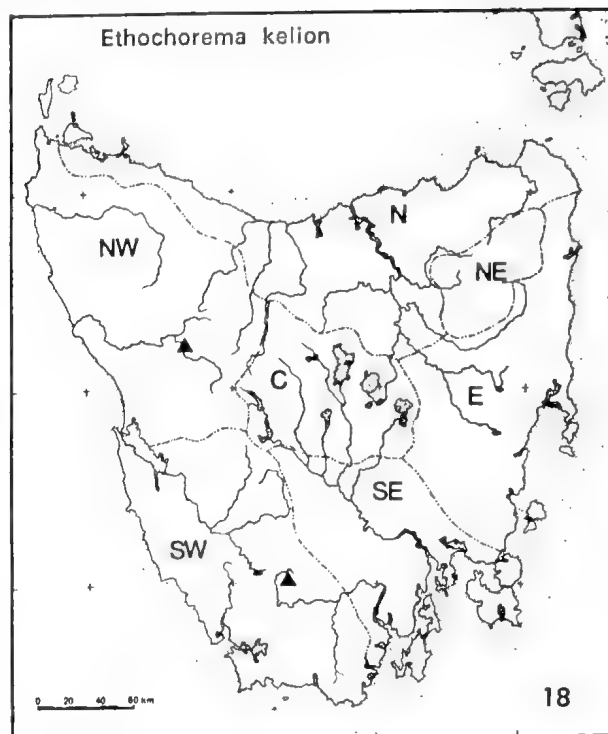
Anterior wing brown, distinctly and irregularly mottled with pale-yellowish spots, traces of mottling also on distal section of the posterior wing. The anterior wings of the male without a fold along C-Sc, a pair of bristles on the anal margin present. Posterior wing with cell-like structure small, androconia on  $A_2$  present, but there are only long hairs on  $A_3$ . The antero-mesal wart on the head not divided by central line; front ocellus large.

♂ *genitalia*: segment 10 upcurved, widened apically, two fingerlike processes at the base. Superior appendage stout; inferior appendage large, robust, widened at the base, bearing a group of spines on the inner surface. Phallus with proximal half wide, gradually tapering, distal half very slender; a pair of robust, apically downturned parameres. Lateral filament on sternite 5 slightly curved, apex rounded; ventral process on sternite 6 stout, with a few strong spines at the apex; ventral process on sternite 7 small.

♀ abdomen tapers gradually to a narrow, rounded apex; the ridge on sternite 5 ventrally produced to a moderately slender ventral process, a few strong spines at the apex; ventral process on segment 6 small; posterior margin on sternite 7 slightly produced and covered with group of long hairs.

*Length of anterior wing*: ♂ 8.5-10.5 mm; ♀ 11 mm.

*Type material*: Holotype ♂ (T4852), allotype ♀ (T4853) Condominion Creek, Tas., 15 Feb.



1971, A. Neboiss (NMV); 1 ♂ paratype Murchison River, Tas., 5 Feb. 1967, E. F. Riek (ANIC).

**Distribution:** Tasmania—NW and SW provinces.

### Genus *Taschorema* Mosely

*Taschorema* Mosely, 1936a:422; Ross and King, 1951:503; Mosely and Kimmins, 1953:434; Kimmins, 1960:184; Neboiss, 1962:552.

*Notiobiosis* Banks, 1939:499; Mosely and Kimmins, 1953:444; Ross, 1956:125.

*Type species*: *Taschorema asmana* Mosely, 1936.

After removing seven species from the genus and placing them into two new genera, only seven other species remained, and even these are not all acceptable without certain objections, but being from localities outside Tasmania, further analysis of their characters is beyond the scope of this work. The genus now contains a total of nine species, two of them being described as new, and all but three, are from Tasmania.

The genus is characterized by having forks 1 and 2 in the anterior wing long and sessile, the former usually very narrow; posterior wing



with cell-like structure between  $Cu_2$  and  $A_1$  in male. Other characters as described previously.  
Spurs 2:4:4.

KEY TO SPECIES OF *TASCHOREMA*

(Males only)

1. Radius forked distally . . . . . 2
- Radius not forked . . . . . (Vic.) *rugulum*
2. Fork 1 in posterior wing absent . . . . . (W.A.) *pallescens*
- Fork 1 in posterior wing present, with footstalk . . . . . 3
3. Anterior wing with two long bristles at the anal margin . . . . . 5
- Anterior wing without bristles at the anal margin . . . . . 4
4. Anterior wing folded along C-Sc . . . . . (Vic.) *kimminsi*
- Anterior wing without a fold along C-Sc . . . . . (N.S.W., Vic., Tas.) *evansi*
5. Cell-like structure in posterior wing between  $Cu_2$  and  $A_1$  long . . . . . 7
- Cell-like structure in posterior wing between  $Cu_2$  and  $A_1$  short, rather inconspicuous . . . . . 6
6. Inferior appendages long . . . . . (Tas.) *viridarium*
- Inferior appendages short . . . . . (Tas.) *pedunculatum*
7. Processes at the base of segment 10 short and broad . . . . . 8
- Processes at the base of segment 10 long and slender . . . . . (Tas.) *ferulum*
8. Anterior wing uniform in colour . . . . . (Tas.) *asmanum*
- Anterior wing with basal half dark, distal half lighter in colour . . . . . (Tas.) *apobamum*

19 *Taschorema asmanum* Mosely

Figures 99-102

*Taschorema asmana* Mosely, 1936a:422; Mosely and Kimmins, 1953:434.

*Taschorema asmanum*, Neboiss, 1962:564.

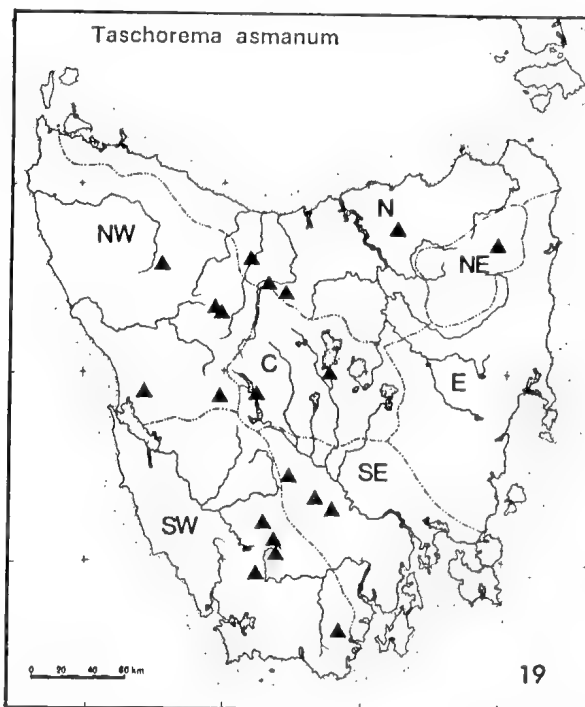
Similar to the two other closely related species *apobamum* and *ferulum* described in this paper, *asmanum* is characterized by a narrow sessile fork 1 on the anterior wing; in the male the lateral filament on sternite 5 terminates with a small apical hook; two long bristles on the anal margin of the anterior wing; cell-like

structure on posterior wing between  $Cu_2$  and  $A_1$  long; androconia on  $A_2$  and  $A_3$  present. It can easily be separated by the distinctive male genitalia as shown in the illustrations.

♂ genitalia with the plates at the base on segment 10 with apices pointed and curved upward and a small wart on proximal section. Inferior appendages stout, broad at base, narrowing slightly to obliquely truncate apices, inner angles triangular, apices acute; proximal half of inner margins bearing long, coarse, basally directed spines. Phallus very long, curved downwards. Ventral process on sternite 6 short, robust, bearing a few stout spines near apex; process on sternite 7 very long, slightly upcurved.

♀ abdomen terminates into a blunt, rounded apex; the ridge on sternite 5 terminates at the lateral margin, but ventrally extends to a strong ventral process; ventral process on sternite 6 smaller than that on sternite 5; posterior margin of sternite 7 produced into a central triangular projection, covered with short, dense pubescence, on either side of which there are somewhat squarish lobes.

Length of anterior wing: ♂ 10-12 mm; ♀ 11-12.5 mm.



*Type material:* Type ♂ Great Lake, Micna, Tas., Jan. 1931 (BMNH). Type not seen.

*Material examined:* Tasmania—1 ♂ 3 ♀ St. Columba Falls, Pyengana, 21 Feb. 1971; 1 ♂ 4 km E of Liena, small creek, 17 Nov. 1972; 2 ♂ 1 ♀ Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971; 2 ♂ 20 ♀ Dove River, Cradle Mtn. Nat. Park, 14 Dec. 1974; 3 ♂ 2 ♀ Derwent River 2 km NW Derwent Bridge, 12 Feb. 1971; 1 ♂ Franklin River 20 km SW Derwent Bridge, 11 Feb. 1971; 1 ♂ Lake Dobson, 20 Feb. 1967; 1 ♂ 3 ♀ Wedge River, 17 Feb. 1971; 2 ♂ 5 ♀ Huon River Crossing, 16 Feb. 1971; 3 ♂ 1 ♀ Condominion Creek, 15 Feb. 1971; 1 ♂ West Arthur Plains, 7 Feb. 1965; 2 ♀ Russell Falls, Nat. Park, 15 Nov. 1972; 1 ♀ Cashion Creek Cave, Florentine Valley, 29 Dec. 1964, T. Goede; 1 ♂ 7 ♀ nr. Marakoopa Caves, 15 Dec. 1974; 2 ♀ Hot Springs Creek, Hastings Caves, 14 Nov. 1972; 1 ♀ Lilydale, creek 2 km N, 16 Dec. 1974. All specimens collected by A. Neboiss, unless stated otherwise (NMV). 1 ♂ Fossey River 10 mls S Hellyer Gorge, 5 Feb. 1967, E. F. Riek (ANIC); 2 ♂ 2 ♀ Forth Falls, 28 Jan. 1967, E. F. Riek (ANIC); 7 ♂ 8 ♀ Lake Dobson, 20 Feb. 1967, E. F. Riek (ANIC); 1 ♀ 10 mls E Strahan, 6 Feb. 1967, E. F. Riek (ANIC).

*Other recorded localities:* Derwent Bridge.

*Distribution:* Tasmania—NE, C, N, NW, SW and SE provinces.

## 20 *Taschorema apobamum* sp. n.

Figures 103-109

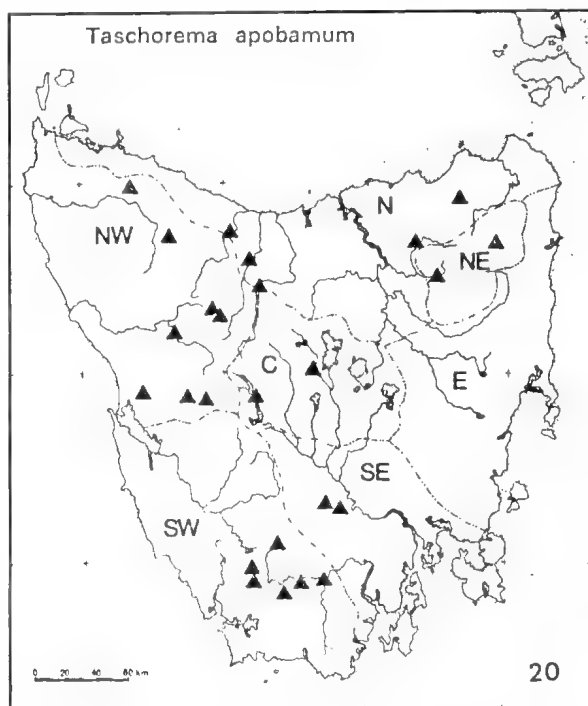
This is one of the largest Rhyacophilid species not only in Tasmania, but also in Australia. The two tone anterior wings in male with basal half rich, dark-brown and paler light-brown distal half, makes the species easily recognizable; two long bristles on anal margin present, the cell-like structure on posterior wing between  $Cu_2$  and  $A_1$  long; androconia on  $A_2$  and  $A_3$  present, lateral filament on sternite 5 with small apical hook. The anterior wings in female are concolorous rich brown.

♂ genitalia of similar plan to *asmanum* but differs in details. The plates at the base of segment 10 pointed apically with small peglike wart on proximal section. Inferior appendages long, curved, broad at base, constricted in the middle and widened to a truncate apex; a few inward and basally directed long spines arise from the upper inner margin of the basal section. Phallus long, curved downward. Short ventral process on sternite 6 with few strong, apical spines; ventral process on sternite 7 long, curved upwards.

♀ abdomen gradually tapers to a blunt apex,

ridge on sternite 5 ends at the lateral margin, and ventrally extends to a strong ventral process; very small pointed ventral process on sternite 6; posterior margin of sternite 7 in the middle extends to a broad, triangular projection, which is covered with short, dense pubescence, on either side of it, there is a broad, distally bluntly pointed lobe.

*Length of anterior wing:* ♂ 10-12.5 mm; ♀ 11-14 mm.



*Type material:* Holotype ♂ (T4901), allotype ♀ (T4902) 6 ♂ 6 ♀ paratypes (T4903-T4914) St. Patricks River, Targa, Tas., 22 Feb. 1971, A. Neboiss (NMV).

*Other material examined:* Tasmania—4 ♀ Great Forester River 5 km NW Forester, 11 Nov. 1972; 1 ♂ 2 ♀ St. Columba Falls, Pyengana, 21 Feb. 1971; 2 ♀ Derwent River 2 km NW Derwent Bridge, 12 Feb. 1971; 14 ♂ 3 ♀ Franklin River 20 km SW Derwent Bridge, 11 Feb. 1971; 5 ♀ Mersey River, Liena, 16 Nov. 1972; 2 ♀ Russell Falls, Nat. Park, 15 Nov. 1972; 1 ♀ Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971; 31 ♀ Hellyer River Gorge, 9 Feb. 1971; 2 ♂ 5 ♀ Huon River Crossing, 16 Feb. 1971; 44 ♂ 98 ♀ Huon-Picton River junction, 18 Feb. 1967; 2 ♀ Huon Plains nr. Scotts Peak, 2 Feb. 1965; 5 ♀ Huon River nr. Blakes Opening, 9 Feb. 1966; 1 ♀ West Arthur Plains, 6 Feb. 1965; 28 ♀ Cracroft River, 8 Feb. 1966; 1 ♂ (pupa) Styx River, Westerwav, 23 Nov. 1972, J. Blyth; 1 ♀ Collingwood River 30 km E of Gormans-ton, 6 Nov. 1972; 23 ♀ Collingwood River bridge,

Lyell h-way, 9 Dec. 1974; 4 ♀ Dove River, Cradle Mtn. Nat. Park, 14 Dec. 1974; 1 ♀ National Park, 20 Feb. 1967; 5 ♀ Leven River, Heka, 17 Nov. 1972; 5 ♀ Dip River Falls, 1 Dec. 1974. All specimens collected by A. Neboiss unless stated otherwise (NMV). 1 ♂ North Esk River 20 mls E Launceston, 1 Mar. 1967, E. F. Riek (ANIC); 1 ♂ Ouse River 5 mls W Miena, 28 Feb. 1967; 7 ♂ 8 ♀ Franklin River, 10 Feb. 1967, E. F. Riek (ANIC); 1 ♀ 10 mls E. Strahan, 6 Feb. 1967, E. F. Riek (ANIC); 1 ♂ 4 ♀ Forth Falls, 28 Jan. 1967, E. F. Riek (ANIC); 10 ♂ 21 ♀ Huon-Picton River junction, 17 Feb. 1967, E. F. Riek (ANIC); 1 ♂ 33 ♀ Hellyer Gorge, 4 Feb. 1967, E. F. Riek (ANIC); 1 ♂ 7 ♀ Derwent River, 12 Feb. 1967, E. F. Riek (ANIC); 3 ♂ 13 ♀ Murchison River, 5 Feb. 1967, E. F. Riek (ANIC).

**Distribution:** Tasmania—all provinces except E province.

## 21 *Taschorema ferulum* sp. n.

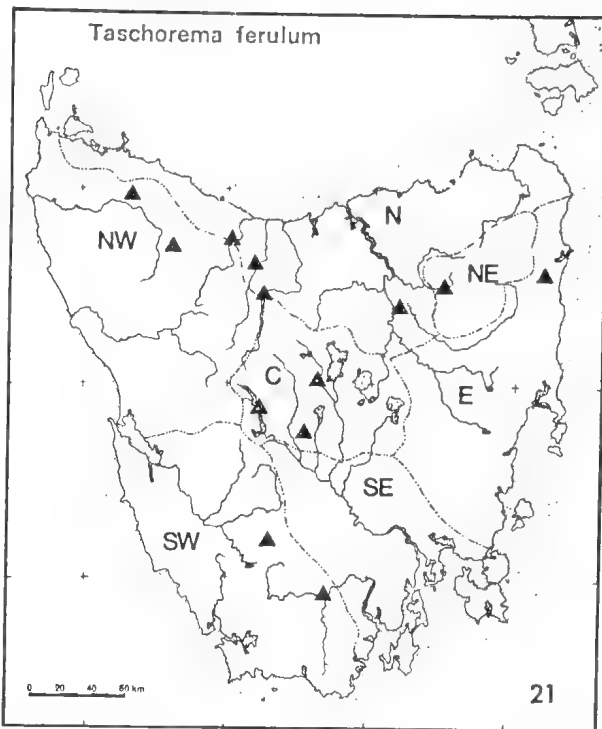
Figures 110-114

This species is very similar to *asmanum* but can be separated by the details of the male genitalia as illustrated. At the base of segment 10, instead of a short, pointed plate, there is a long, finger-like process, widened at the base, from which arises a long, thin, slightly down-curved rod. Inferior appendages short, broad at base, in lateral view gradually tapering towards the apex; inner margin flattened, curved and terminating with inwardly directed blunt angle. Phallus long, curved downward. Lateral filament on sternite 5 with small apical hook, small ventral process on sternite 6, a long one on sternite 7. Anterior wing with two long bristles on anal margin. Posterior wing with cell-like structure long, androconia on  $A_2$  and  $A_3$  present.

♀ abdomen terminates into a broad, blunt apex, the ridge on sternite 5 terminates at the lateral margin, but ventrally extends to a strong ventral process; ventral process on sternite 6 small; sternite 7 with deep, rounded depression in the middle, distal half of the sternite broad, produced posteriorly, fringed with fine hair and a pair of small, rounded lobes distally.

**Length of anterior wing:** ♂ 10-12 mm; ♀ 11-13 mm.

**Type material:** Holotype ♂ (T4915), allotype ♀ (T4916), 2 ♂ 8 ♀ paratypes (T4917-T4926) South Esk River, Evandale, Tas., 1 Mar. 1967, A. Neboiss (NMV); 2 ♂ paratypes (T4927-T4928) Derwent River 2 km NW Derwent Bridge, Tas., 12 Feb. 1971, A.



Neboiss (NMV); 1 ♂ paratype (T4929) Wedge River, Tas., 17 Feb. 1971, A. Neboiss (NMV); 1 ♂ paratype (T4930) North Esk River, Blessington, Tas., 1 Mar., 1967 (with pupal and larval skin), A. Neboiss (NMV).

**Other material examined:** Tasmania—1 ♀ Derwent River 2 km NW Derwent Bridge, 12 Feb. 1971; 16 ♀ Leven River, Heka, 17 Nov. 1972; 3 ♀ Dip River Falls, 1 Dec. 1974; 23 ♀ Scamander River, Upper Scamander, 9 Nov. 1972; 10 ♀ Mersey River, Liena, 16 Nov. 1972; 2 ♀ Huon-Picton River junction, 18 Feb. 1967; 2 ♀ same loc., 15 Nov. 1972; 1 ♀ Hellyer River Gorge, 9 Feb. 1971; 1 ♀ Ouse River 8 km W of Miena, 28 Feb. 1967. All specimens collected by A. Neboiss (NMV). 1 ♂ Bronte Lagoon, 15 Feb. 1967, E. F. Riek (ANIC); 1 ♂ Bronte—Bradys Canal, 27 Feb. 1967, E. F. Riek (ANIC); 7 ♀ Forth Falls, 28 Jan. 1967, E. F. Riek (ANIC); 17 ♀ Evandale, 1 Mar. 1967, E. F. Riek (ANIC); 3 ♂ 26 ♀ Derwent Bridge, 12 Feb. 1967, E. F. Riek (ANIC); 1 ♀ Ouse River 8 km W Miena, 28 Feb. 1967, E. F. Riek (ANIC).

**Distribution:** Tasmania—all provinces except SE province.

## 22 *Taschorema viridarium* Neboiss

Figures 115-117

*Taschorema viridarium* Neboiss, 1962: 563.

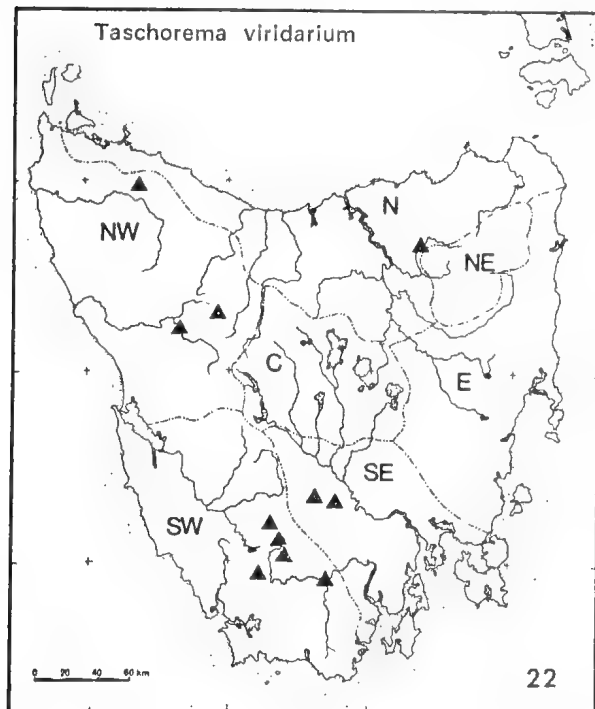
This is one of the smallest species in the genus, in general appearance light yellowish-brown. The anterior wing in male with two long bristles on the anal margin; posterior wing

with short, cell-like structure between  $Cu_2$  and  $A_1$ , androconia on  $A_2$  and  $A_3$  present.

♂ genitalia characterized by having the plates at the base of segment 10 partly fused with it, thus forming a pair of broad lobes. Inferior appendages in lateral view broad at proximal half, from about the middle gradually tapering apically, dorso-ventrally flattened and curved inward to a blunt angle; inner surface with basally directed stout spines. Phallus slender, straight, with lower margin apically forming an upcurved hook, upper margin terminating into a pair of short, straight projections; on either side of phallus are stout, rod-like parameres, turned downwards at distal end, upper angle with a pair of long, stiff bristles and a pair of shorter ones near apex. Very long ventral process on sternite 7, a short and stout one on sternite 6. Lateral filament on sternite 5 terminates with a minute point.

♀ abdomen with ridge on sternite 5 terminating at the lateral margin, ventrally developed into a strong ventral process, a smaller one on sternite 6; posterior margin of sternite 7 in the middle broadly produced.

Length of anterior wing: ♂ 6-7.5 mm; ♀ 6-8 mm.



*Type material:* Holotype ♂, allotype ♀ Broad River nr. Lake Dobson, Mt Field Nat. Park, Tas., 6 Nov. 1955, T. E. Woodward (QM). Type seen.

*Material examined:* Tasmania—1 ♂ St. Patricks River, Targa, 22 Feb. 1971; 15 ♂ 1 ♀ Huon-Picton River junction, 18 Feb. 1967; 11 ♂ 3 ♀ Wedge River, 17 Feb. 1971; 17 ♂ Huon River Crossing, 16 Feb. 1971; 2 ♂ Condominion Creek, 15 Feb. 1971; 1 ♂ West Arthur Plains, 3 Feb. 1965; 2 ♂ Junction Creek, West Arthur Plains, 7 Feb. 1966; 2 ♀ Dove River, Cradle Mtn. Nat. Park, 14 Dec. 1974; 1 ♂ Dip River Falls 10 km S of Mawbanna, 1 Dec. 1974. All specimens collected by A. Neboiss (NMV). 1 ♂ Murchison River, 5 Feb. 1967, E. F. Riek (ANIC); 1 ♂ Lake Dove, Cradle Mtn., 30 Jan. 1967, E. F. Riek (ANIC); 2 ♂ Lake Dobson, 20 Feb. 1967, E. F. Riek (ANIC).

*Other recorded localities:* Tyenna River nr. Tyenna; Dove River, Cradle Mtn.

*Distribution:* Tasmania—N, NW, SW and SE provinces.

### 23 *Taschorema pedunculatum* Jacquemart

Figures 118-122

*Taschorema pedunculata* Jacquemart, 1965b: 35.

Irrespective of the discrepancies between the original illustrations and the figures presented here from specimens collected at Cradle Mtn. and Condominion Creek, it was found that they agree with the holotype and represent the same species. The most important deviations are the shape of the phallus, the dorsal view of segments 9 and 10; the shape and position of hyaline areas and the omission of one of the anal veins in the anterior wing from the original drawing (Jacquemart 1965a, fig. 27D).

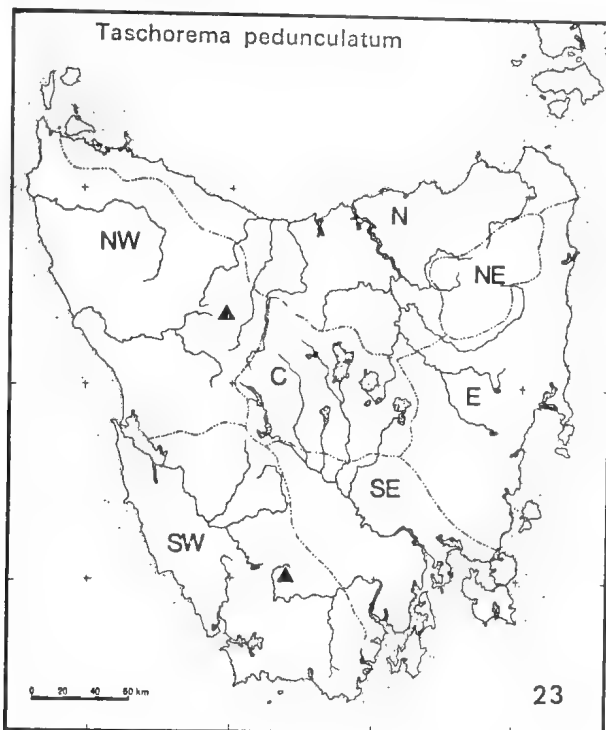
This rather small, dark-brown species appears to be closely related to *T. viridarium*, particularly so, the structure of phallus, parameres and the small, cell-like structure on the posterior wing; androconia on  $A_2$  and  $A_3$  present.

♂ genitalia with segment 10 fused with elongate basal plates, which are indicated by sclerotized bands and somewhat indistinct lateral lobes. Inferior appendages short, broad, curved inward, bilobed apically, group of several stout spines on the inner surface near the apex. Superior appendages longer than the inferior ones. Phallus with lower margin ending with an upcurved hook, upper margin with a pair of straight projections. The phallus is flanked on

either side with strong, apically downturned parameres. Lateral filament on sternite 5 terminates with tiny hook; a small ventral process on sternite 6, a long one on sternite 7.

♀ unknown.

Length of anterior wing: ♂ 6-7 mm.



**Type material:** Holotype ♂ Cradle Mtn. Tas., 12 Jan. 1923 (IRScNB). Holotype dissected and mounted on four microscope slides. Type seen.

**Material examined:** Tasmania—2 ♂ Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971; 2 ♂ Condominion Creek, 14 Feb. 1971, A. Neboiss (NMV).

**Distribution:** Tasmania—NW and SW provinces.

#### 24 *Taschorema evansi* Mosely

Figures 123-125

*Taschorema evansi* Mosely in Mosely and Kimmins, 1953:440; Neboiss, 1962:561.

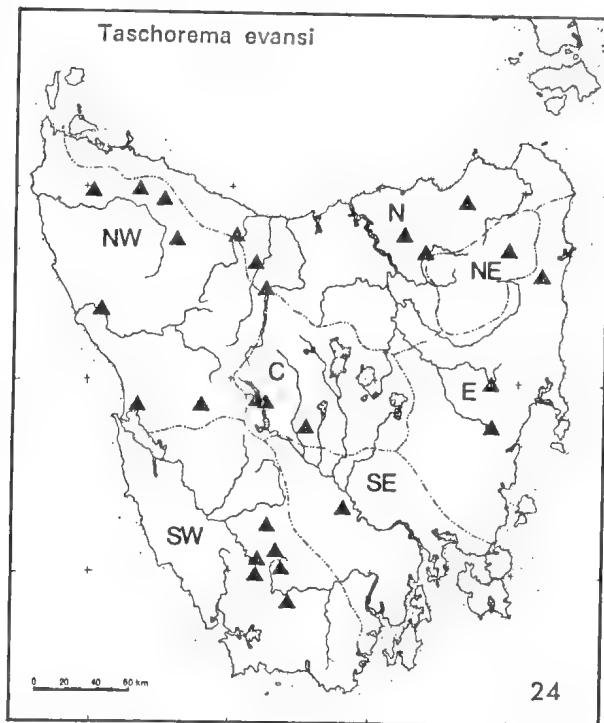
A dark brown, medium size species with widespread distribution.

♂ genitalia characterized by the large inferior appendage, widened toward the apex; on the inner surface of which there is a ridge with strong spines and another group of spines on the upper distal margin. Lateral filament on

sternite 5 terminates with a minute point; ventral processes on sternites 6 and 7, the former slightly larger and with a few stout apical spines. In the male the anterior wing without bristles on anal margin; posterior wing with cell-like structure between  $Cu_2$  and  $A_1$ ; androconia on  $A_2$  and  $A_3$ .

♀ abdomen terminates with darkly pigmented tergites 8 and 9.

Length of anterior wing: ♂ 8-10 mm; ♀ 8-11 mm.



**Type material:** Type ♂ Lake Leake, Tas., Feb. 1937 (BMNH). Type not seen.

**Material examined:** Tasmania—5 ♂ 39 ♀ St. Patricks River, Targa, 22 Feb. 1971; 2 ♂ 7 ♀ Great Forester River 5 km NW Forester, 11 Nov. 1972; 2 ♀ Scamander River, Upper Scamander, 9 Nov. 1972; 2 ♀ Leven River, Heka, 17 Nov. 1972; 1 ♂ 2 ♀ Flowerdale River, Meunna, 4 Nov. 1972; 3 ♂ 4 ♀ Derwent River 2 km NW of Derwent Bridge, 12 Feb. 1971; 1 ♂ National Park, Tyenna River, 19 Feb. 1971; 2 ♀ Corinna, 5 Nov. 1972; 2 ♀ same loc., 13 Mar. 1973, G. Minko; 1 ♂ 8 ♀ Huon River Crossing, 16 Feb. 1971; 1 ♀ same loc., 8 Feb. 1965; 1 ♀ Huon River nr. Scotts Peak, 8 Feb. 1965; 3 ♀ Lake Pedder, 31 Jan. 1965; 3 ♂ Condominion Creek, 15 Feb. 1971; 6 ♀ Collingwood River bridge, Lyell h-way, 9 Dec. 1974; 9 ♀ Lilydale, a creek 2 km N, 16 Dec. 1974; 4 ♀ Hellyer River Gorge, 9 Feb. 1971; 1 ♀ same loc., 12 Dec. 1974; 5 ♀ Duck River 6 km SW of Roger River, 29 Nov. 1974; 1 ♂ 1 ♀ Hogarth Falls, Strahan, 10

Dec. 1974; 1 ♀ Lake St. Clair, Derwent Basin, 6 Dec. 1974; 4 ♂ Tooms Lake, 4 Dec. 1974; 8 ♂ 7 ♀ Dip River Falls 10 km S of Mawbanna, 1 Dec. 1974; 1 ♀ Wedge River, 17 Feb. 1971; 2 ♀ Cracroft River, 8 Feb. 1966; 1 ♀ Mersey River, Liena, 16 Nov. 1972; 1 ♀ St. Columba Falls, Pyengana, 21 Feb. 1971. All specimens collected by A. Neboiss, unless stated otherwise (NMV). 4 ♂ Derwent Bridge, 12 Feb. 1967, E. F. Riek (ANIC); 1 ♂ Bronte Lagoon, 15 Feb. 1967, E. F. Riek (ANIC); 8 ♂ 12 ♀ Forth Falls, 28 Jan. 1967, E. F. Riek (ANIC); 1 ♂ 3 ♀ Hellyer Gorge, 4 Feb. 1967, E. F. Riek (ANIC).

**Distribution:** Tasmania—all provinces; Victoria; South Australia.

### Genus *Ptychobiosis* gen. n.

**Type species:** *Notiobiosis nigrita* Banks, 1939.

Among the species previously included in the genus *Taschorema*, two species—*nigrita* and *rieki* showed similarities not found among the others, and therefore they are now segregated to form a new genus.

Ocelli present; anterior wings with radius straight, not forked distally; forks 1, 2, 3, 4 and 5 present, forks 1 and 2 long, sessile, others with footstalks; discoidal cell closed; in posterior wing Sc merges with Rs shortly before wing margin. In male a large pouch at the proximal half of  $A_2$  in the posterior wing. In females the ridge on sternite 5 terminates at the lateral margin; mid-posterior margin of sternite 8 extended almost to the end of abdomen.

Spurs 2:4:4.

Only one species in Tasmania.

### 25 *Ptychobiosis nigrita* (Banks)

Figures 126-130

*Notiobiosis nigrita* Banks, 1939:500; Mosely and Kimmins, 1953:446; Ross, 1956:114, 125.

*Taschorema nigra* Mosely in Mosely and Kimmins, 1953:436.

*Taschorema nigrita*, Kimmins, 1960:184; Neboiss, 1962:565.

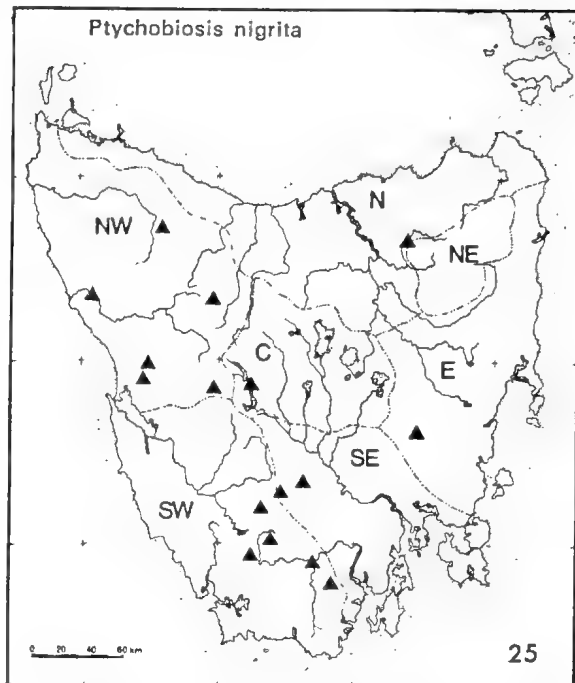
This rather large, dark blackish-brown species is widely distributed throughout the Australian eastern states as far as North Queensland. Although there is some variation in the male genitalia, this is not considered sufficient for specific separation.

In the anterior wing Rs is not forked apically and there is no bend just before the pterostigma. The hyaline area in the middle of the wing is separated into two separate sections. In posterior wing  $A_1$  is normal, a large pouch is located on  $A_2$ , androconia absent on  $A_3$ . La-

teral filament on sternite 5 absent; strong ventral process on sternite 6, a long, rather broad and somewhat flattened ventral process on sternite 7.

♀ abdomen terminates with downsloping truncate apex; sternite 8 extends posteriorly almost to the end of abdomen.

**Length of anterior wing:** ♂ 9-12 mm; ♀ 10-13 mm.



**Type material:** Type ♂ Mt Spurgeon, N Qld. 1100-1200 m; 26 Jul. (Darlington). Originally deposited in MCZ, later transferred to ANIC. Type not seen.

Type ♂ of *Taschorema nigra* Mosely, National Park, Qld. 900 m, 21 Dec. 1921 (BMNH). Type not seen.

**Material examined:** Tasmania—1 ♂ St. Patricks River, Targa, 22 Feb. 1971; 1 ♀ Andover, York Rivulet, 4 Dec. 1974; 3 ♂ 2 ♀ Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971; 1 ♂ Corinna, 5 Nov. 1972; 1 ♀ Henty River 12 km NW Queenstown, 10 Feb. 1971; 1 ♂ Wedge River, 17 Feb. 1971; 3 ♂ 2 ♀ Huon-Picton River junction, 18 Feb. 1967; 2 ♂ Condominion Creek, 15 Feb. 1971; 2 ♂ West Arthur Plains, 6 Feb. 1965. All specimens collected by A. Neboiss (NMV). 1 ♂ Franklin River, 10 Feb. 1967, E. F. Riek (ANIC); 4 ♂ 1 ♀ 10 mls E Strahan, 6 Feb. 1967, E. F. Riek (ANIC); 1 ♂ 1 ♀ 7 mls W Maydena, 25 Feb. 1967, E. F. Riek (ANIC); 3 ♂ Lake Dobson, 20 Feb. 1967, E. F. Riek (ANIC); 1 ♂ Derwent

River, 12 Feb. 1967, E. F. Riek (ANIC); 1 ♂ Hellyer Gorge, 4 Feb. 1967, E. F. Riek (ANIC); 1 ♂ Arve River, 23 Feb. 1963, I. F. B. Common and M. S. Upton (ANIC).

**Distribution:** Tasmania—E, N, NW, SW and SE provinces; Queensland; New South Wales; Victoria; South Australia.

### Genus *Koetonga* Neboiss

*Koetonga* Neboiss, 1962:567.

**Type species:** *Koetonga clivicola* Neboiss, 1962.

Wing venation regular in anterior wing, with forks 1, 2, 3, 4 and 5 present; forks 1 and 2 very long, sessile, others with footstalks; discoidal cell closed; an additional oblique cross-vein located between  $A_1$  and  $A_2$ ; venation in posterior wing irregular and differing in sexes. Ventral process in male on sternites 6 and 7; in female on sternites 5 and 6; the ridge on sternite 5 terminates at the lateral margin.

Spurs 2:4:4.

### 26 *Koetonga clivicola* Neboiss

Figures 131-133

*Koetonga clivicola* Neboiss, 1962:567.

Insect robust, anterior wings dark-brown with yellowish mottling, posterior wings concolorous yellowish with aberrant venation in sexes as figured. The Tasmanian specimens agree well with original description.

**Length of anterior wing:** ♂ 11-12 mm; ♀ 12-14 mm.

**Type material:** Holotype ♂, allotype ♀ Timbertop nr. Merrijig, Vic., 5 June 1958, I. F. Edwards (ANIC). Type seen.

**Material examined:** Tasmania—6 ♂ Huon River Crossing, 16 Feb. 1971; 2 ♀ West Arthur Plains, 3 Feb. 1965; 1 ♂ Hot Springs Creek nr. Hastings Caves, 14 Nov. 1972; 7 ♂ 1 ♀ Duck River 6 km SW of Roger River, 29 Nov. 1974; 5 ♂ nr. Marakoopa Caves, 15 Dec. 1971; 13 ♂ 1 ♀ Lilydale, a creek 2 km N, 16 Dec. 1974; 1 ♂ Dove River, Cradle Mtn. Nat. Park, 14 Dec. 1974. All specimens collected by A. Neboiss (NMV). 1 ♂ 10 mls E Strahan, 6 Feb. 1967, E. F. Riek (ANIC).

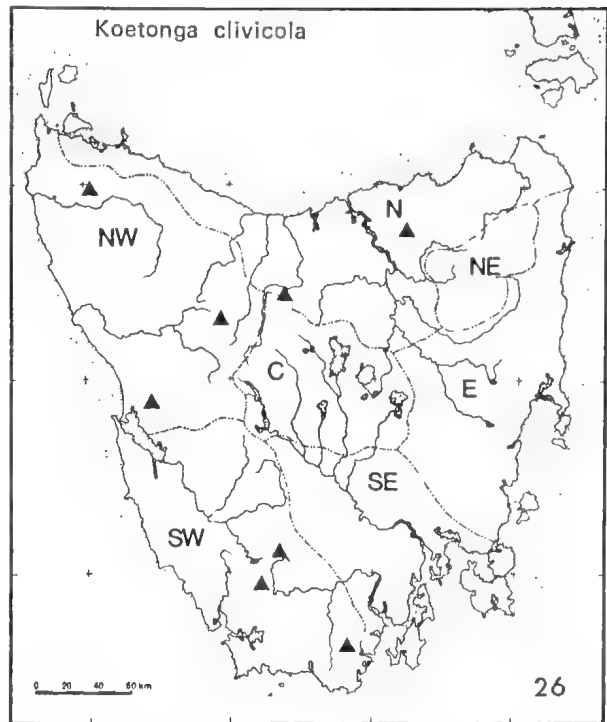
**Distribution:** Tasmania—N, NW and SW provinces; New South Wales; Victoria.

Tribe Psyllobetini trib. n.

Genus *Moruya* Neboiss

*Moruya* Neboiss, 1962: 569.

**Type species:** *Moruya charadra* Neboiss, 1962.



Anterior wings densely covered with fine hairs, but the coarse erect hairs absent; forks 1, 2, 3, 4 and 5 present, all with footstalks, except fork 2; footstalk of fork 1 very short; discoidal cell open in male, closed in female; posterior wing with forks 1, 2, 3 and 5 present, fork 2 long, sessile, others with footstalks; discoidal cell open in both sexes; cross-vein m-cu strongly convex. The abdomen in females terminates in a long, slender, upcurved oviscapt, a pair of small cerci at apex; male genitalia with segment 10 long and slender, inferior appendages two-segmented, coxopodite stout, longer than harpago; lateral filament on sternite 5 present.

Spurs 2:4:4.

### KEY TO SPECIES OF *MORUYA*

(Males only)

1. The processes arising at the base of segment 10 asymmetric . . . . . *charadra*
- The processes arising at the base of segment 10 symmetric . . . . . 2
2. The short upper process at the base of segment 10 simple, the lower one long, with apex turned slightly upward . . . . . *tasmanica*



- The short upper process at the base of segment 10 two-branched, the lower one long, with apex turned downward . . . . *opora*

## 27 *Moruya charadra* Neboiss

Figures 134-139

*Moruya charadra* Neboiss, 1962:570.

Anterior wing in male with long, distally directed hairs along the costa; posterior wing with large area of short, upright setae on dorsal surface; lateral filament on sternite 5 stout, abruptly tapered to fine pointed apex; ventral process on sternite 7 short, flat.

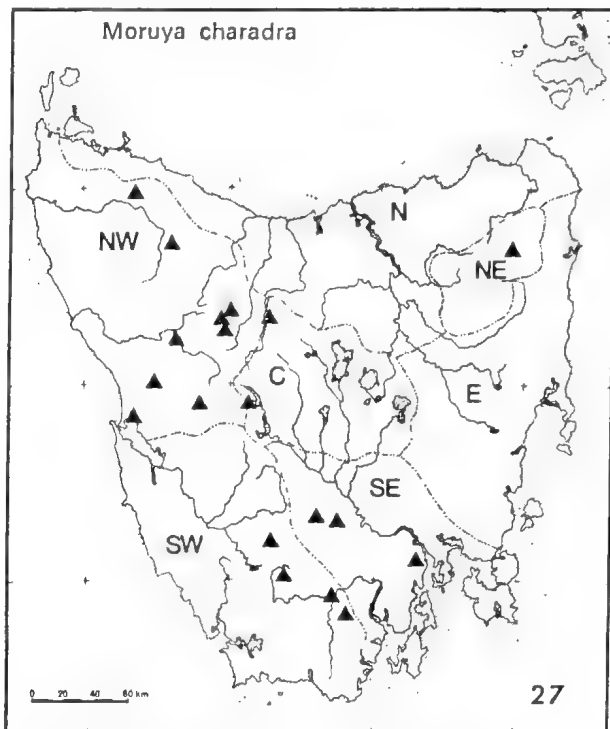
♂ genitalia with segment 10 long, rounded apically; at the base arise two pairs of asymmetric processes, a short upper one, two-branched, and a long lower one. The entire structure is twisted to the right side where both processes are longer. Inferior appendage with coxopodite robust, an elongate group of spines on the inner surface near the base; harpago short, somewhat twisted. Phallus long, slender, with an upward directed, slightly curved spur in the middle.

♀ abdomen terminates into a slender, up-curved oviscap. The outline of the inner structure near the base visible in cleared preparations, is helpful in species identification, but otherwise the smaller size and fork 5 in anterior wing, more or less gradually widened to full width, separate the female of this species from *opora*.

Length of anterior wing: ♂ 5-6.5 mm; ♀ 6-7 mm.

Type material: Holotype ♂, allotype ♀ Broad River nr. Lake Dobson, Tas., 6 Nov. 1955, T. E. Woodward (QM). Type seen.

Material examined: Tasmania—3 ♂ 1 ♀ Lake Dobson, 20 Feb. 1967; 1 ♂ Henty River 12 km NW Queenstown, 10 Feb. 1971; 2 ♂ 1 ♀ Wedge River, 17 Feb. 1971; 2 ♂ 5 ♀ Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971; 1 ♂ Fisher River, Pencil Pine Grove below Lake Mackenzie dam, 15 Dec. 1974; 1 ♂ Pencil Pine River 6 km N of Cradle Mtn., 13 Dec. 1974; 2 ♂ 2 ♀ Dove River, Cradle Mtn. Nat. Park, 14 Dec. 1974; 3 ♂ 2 ♀ Huon-Picton River junction, 18 Feb. 1967; 1 ♂ Condominion Creek, 15 Feb. 1971; 1 ♂ St. Columba Falls, Pyengana, 21 Feb. 1971; 1 ♂ Arve River 10 km W of Geeveston, 15 Nov. 1972; 1 ♀ Russell Falls, Nat. Park, 23 Feb. 1967; 1 ♂ Hogarth Falls, Strahan, 10 Dec. 1974; 1 ♂ 1 ♀ Collingwood River bridge, Lyell h-way, 9 Dec. 1974; 1 ♀ Strickland Ave., Hobart, 8 Dec. 1974; 1 ♀ Mt. Wellington, 8 Dec. 1974; 26 ♂ 32 ♀ Dip River Falls, 1 Dec. 1974.



All specimens collected by A. Neboiss (NMV). 1 ♂ Murchison River, 5 Feb. 1967, E. F. Riek (ANIC); 1 ♂ Hellyer Gorge, 4 Feb. 1967, E. F. Riek (ANIC); 2 ♂ 7 ♀ Lake Dobson, 20 Feb. 1967, E. F. Riek (ANIC).

Other recorded localities: Dove River nr. Lake Dove; Hugel River, Lake St. Clair.

Distribution: Tasmania—NE, C, NW, SW and SE provinces.

## 28 *Moruya opora* Neboiss

Figures 140-145

*Moruya opora* Neboiss, 1962: 571.

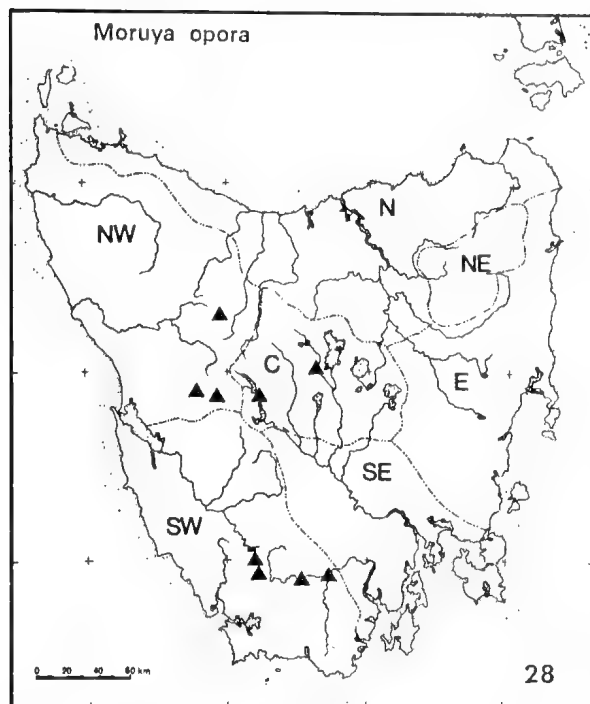
This species is very closely related to *M. charadra* and differs only by its slightly larger size and details of genitalia structure, and by the large area with short, upright setae present on the posterior wing.

♂ genitalia symmetric; the upper process at the base of segment 10 short, two-branched, the lower process longer than superior appendage, apex abruptly turned downward. Inferior appendages with coxopodite stout, inner margin with an elongate group of spines near the base, upper apical angle acute; harpago short, curved, inner lower angle directed basally. Lateral filament on sternite 5 stout, tapered apically, and ending with a small, laterally directed hook; ventral process on sternite 7 small, flat.



♀ abdomen terminates into a slender, up-curved oviscapt; the outline of inner structure near the base differs from that of *charadra* as shown in fig. 145. Fork 5 in anterior wing rather abruptly widened to full width.

Length of anterior wing: ♂ 7.5-9 mm; ♀ 8-9.5 mm.



**Type material:** Holotype ♀ Ouse River nr. Great Lake, Tas., 2 Apr. 1960, E. T. Smith (ANIC). Type seen.

**Material examined:** Tasmania—1 ♂ Ouse River 8 km W of Miena, 28 Feb. 1967 (description and figures of male prepared from this specimen); 1 ♀ Franklin River 20 km SW of Derwent Bridge, 11 Feb. 1971; 1 ♂ 1 ♀ Derwent River 2 km NW of Derwent Bridge, 12 Feb. 1971; 3 ♂ 6 ♀ Huon-Picton River junction, 18 Feb. 1967; 1 ♂ 4 ♀ Huon River nr. Blakes Opening, 9 Feb. 1966; 1 ♂ West Arthur Plains, 6 Feb. 1965; 1 ♀ Huon River nr. Scotts Peak, 8 Feb. 1965; 1 ♂ Dove River, Cradle Mtn. Nat. Park, 14 Dec. 1974; 2 ♀ Collingwood River bridge, Lyell h-way, 9 Dec. 1974. All specimens collected by A. Neboiss (NMV). 4 ♀ Derwent Bridge, 12 Feb. 1967, E. F. Riek (ANIC); 3 ♂ Huon-Picton junction, 17 Feb. 1967, E. F. Riek (ANIC); 1 ♂ 4 ♀ Franklin River, 10 Feb. 1967, E. F. Riek (ANIC); 3 ♀ Ouse River 8 km W Miena, 28 Feb. 1967, E. F. Riek (ANIC).

**Distribution:** Tasmania—NW, C and SW provinces.

## 29 *Moruya tasmanica* (Jacquemart) comb. nov.

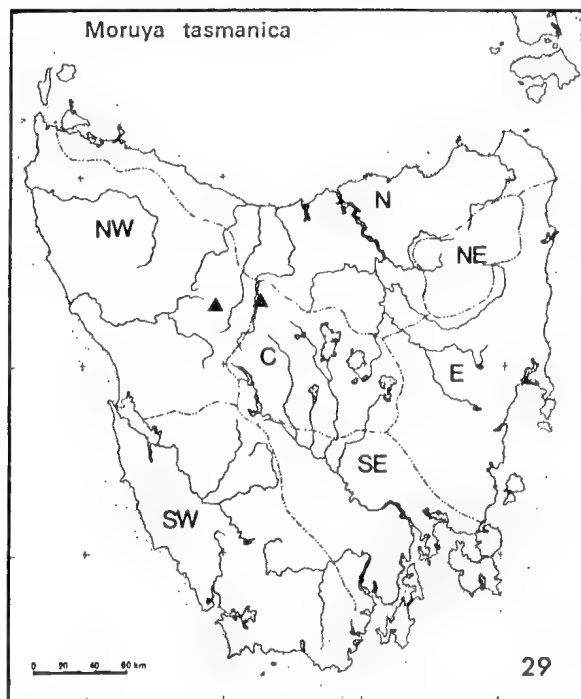
Figure 146

*Psyllobetina tasmanica* Jacquemart, 1965b:45.

The type ♂ which is dissected and mounted on three separate microscope slides, has been re-examined and figured. The wing venation as well as the basic structure of male genitalia, indicate that this species belong to the genus *Moruya*.

Anterior wing with forks 1, 2, 3, 4 and 5 present, discoidal cell open. Posterior wing with forks 1, 2, 3 and 5 present, fork 1 long, with very short footstalk. Due to the nature of mounting, some details of the wings are obscure, but it appears that there are no short, upright setae on the posterior wing. Lateral filament on sternite 5 stout, tapered apically and terminating with laterally directed hook.

♂ genitalia with segment 10 and superior appendages not exceeding the length of inferior appendages. The short upper process at the base of segment 10 simple, turned down and outward; the lower process long, but with slightly shorter superior appendage, gradually turned upward at the apex. Inferior appendage



robust, coxopodite with an elongated group of strong spines on the inner surface near the base; harpago short. Phallus long and slender.

♀ unknown.

*Length of anterior wing:* ♂ 9-10 mm.

*Type material:* Holotype ♂ Cradle Mtn. Tas., 27 Jan. 1923, A. Tonnoir. Type dissected and mounted on three microscope slides (IRScNB). Type seen.

*Material examined:* Tasmania—1 ♂ Snake Creek, Fisher River Road, 15 Dec. 1974, A. Neboiss (NMV).

*Distribution:* Tasmania—NW and C provinces.

## 2 Family GLOSSOSOMATIDAE Ulmer (1903)

The family contains mostly small, dull coloured caddis flies, inhabiting cool, more or less swiftly flowing streams. The larvae construct elongate, dome-shaped cases of small sand grains. For many years these insects were considered as a subfamily of the Rhyacophilidae, but Ross (1956 and 1967) demonstrated that family rank is warranted; he also considered *Synagapetus* as subgenus of *Agapetus*, this being the only genus found in Australia, to which all three Tasmanian species now belong.

*Family diagnosis:* Ocelli present; maxillary palpi five-segmented in both sexes, the first two segments short, subequal; third the longest. Antennae stout, shorter than anterior wings, segment 1 enlarged, about as long as broad, segment 2 short, rounded; the following ones elongate. Anterior wings with forks 1, 2, 3, 4 and 5 present, discoidal cell closed. Posterior wing with forks 1, 2, 3 and 5, or 2, 3 and 5 present, discoidal cell either closed or open. The mid-tibia and tarsus of the females are generally considerably dilated.

Spurs 2:4:4.

### Genus *Agapetus* Curtis

*Agapetus* Curtis, 1834:217; Ross, 1956:158.

#### Subgenus *Synagapetus* McLachlan

*Synagapetus* McLachlan, 1879:484; Mosely and Kimmins, 1953:498.

*Agapetus* subgenus *Synagapetus*, Ross, 1956:159.

*Type species:* *Synagapetus dubitans* McLachlan, 1879.

Anterior wings densely pubescent; forks 1, 2,

3, 4 and 5 present, the first two sessile; discoidal cell closed, rather short. Small, lateral, blister-like protuberance on the dorsal margin of sternite 5 in both sexes. Female abdomen terminates with a pair of slender, two-segmented cerci.

### KEY TO TASMANIAN SPECIES

1. Males with ventral process on sternite 6 . . . . . 2
- Males without ventral process on sternite 6 . . . . . *laparus*
2. Anterior margin of segment 9 angulate in male; female without ventral process on segment 8 . . . . . *cralus*
- Anterior margin of segment 9 broadly curved in male; female with ventral process on segment 8 . . . . . *tasmanicus*

### 30 *Agapetus* (*Synagapetus*) *tasmanicus* (Mosely)

Figures 147-152

*Synagapetus tasmanicus* Mosely in Mosely and Kimmins, 1953:498; Jacquemart, 1965b:39.

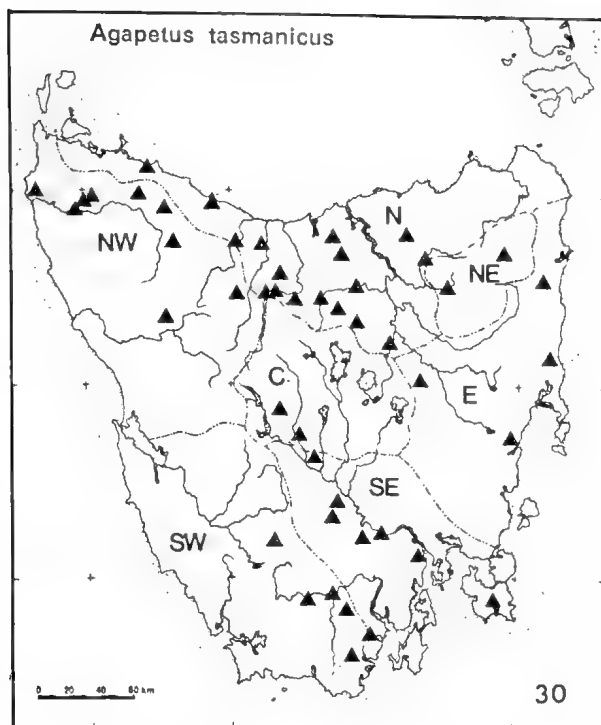
*Agapetus* (*Synagapetus*) *tasmanicus*, Ross, 1956:161.

Small, brown to dark grey-brown species. According to Ross (1956), this species, together with *monticolus*, belong to a group of species in which the anterior margin of segment 9 in the male is broadly curved.

♂ *genitalia*: segment 10 short, tip depressed; superior appendage broad at base, lying somewhat parallel to the upper posterior margin of segment 9, triangularly pointed at apex; inferior appendage in lateral aspect broadly oval, terminal tooth slightly curved, pointing up and inward.

♀ *genitalia*: segment 8 strongly chitinized, laterally elongate oval, with somewhat flattened ventral keel-like process, a slender, anteriorly directed, internal rod arising from anterior margin; segments 9 and 10 membranous; segment 9 with long, slender, internal, anteriorly directed rods; segment 10 terminates with a pair of slender, two-segmented cerci. Small ventral process on sternite 6 and two patches of dark, stiff bristles on sternite 7; mid-tibia and tarsus strongly dilated.

*Length of anterior wing:* ♂ 3.5-4.75 mm; ♀ 4-4.75 mm.



**Type material:** Type ♂ New Norfolk, Tas., Mar. 1938, J. W. Evans (BMNH). Type not seen.

**Material examined:** Tasmania—1 ♂ 4 ♀ Russell Falls, Nat. Park, 23 Feb. 1967; 2 ♀ same loc., 5 Dec. 1972, P. Zwick; 1 ♂ 3 ♀ Ellendale, 4 Dec. 1972, P. Zwick; 2 ♂ 2 ♀ Buxton River nr. Mayfield, 13 Nov. 1972; 12 ♂ 2 ♀ Apsley River, Bicheno, 9 Nov. 1972; 4 ♂ 7 ♀ St. Columba Falls, Pyengana, 21 Feb. 1971; approx. 150 ♂ ♀ Scamander River, Upr. Scamander, 9 Nov. 1972; 1 ♀ Saxon Creek 10 km NW Frankford, 19 Nov. 1972; 1 ♂ 1 ♀ Franklin River, Frankford, 19 Nov. 1972; 2 ♂ Lake River 5 km SW Delmont, 9 Nov. 1972; 1 ♂ 1 ♀ St. Patricks River, Targa, 22 Feb. 1971; approx. 100 ♂ ♀ North Esk River nr. Blessington, 1 Mar. 1967; 8 ♂ 9 ♀ Minnow River, Paradise, 17 Nov. 1972; 2 ♂ 7 ♀ Mersey River, Liena, 16 Nov. 1972; 3 ♂ 2 ♀ Sassafras Creek 4 km W of Mole Creek, 17 Nov. 1972; 5 ♂ 2 ♀ Burnie, 18 Nov. 1972; approx. 150 ♂ ♀ Flowerdale River, Meunna, 4 Nov. 1972; 1 ♀ Clarence River 9 km E of Derwent Bridge, 8 Nov. 1972; 16 ♂ 8 ♀ 5 km W Bronte, small creek, 8 Nov. 1972; 2 ♂ 1 ♀ Hellyer River Gorge, 5 Nov. 1972; 1 ♀ same loc., 2 Dec. 1972, P. Zwick; over 50 ♂ ♀ same loc., 9 Feb. 1971; approx. 200 ♂ ♀ same loc., 12 Dec. 1974; 200 ♂ ♀ Leven River nr. Heka, 17 Nov. 1972; 1 ♂ Mackintosh River, 3 Dec. 1972, P. Zwick; 1 ♂ Wedge River, 17 Feb. 1971; 7 ♂ 1 ♀ same loc., 5 Dec. 1972, P. Zwick; 1 ♀ Huon River nr. Blakes Opening, 9 Feb. 1966; 15 ♂ 1 ♀ Huon-Picton River junction, 18 Feb. 1967; 2 ♀ same loc., 15 Nov. 1972; 1 ♂ Creekton River nr. Dover, 14 Nov. 1972; 10 ♂ 3 ♀ Arve River 10 km W Geeveston, 15 Nov. 1972; approx. 100 ♂ ♀ Hot Springs Creek nr. Hastings Caves, 14 Nov. 1972; 4 ♂ 6 ♀ Eckberg

Creek 12 km SW of Roger River, 29 Nov. 1974; 2 ♀ Meander River 3 km N of Westbury, 16 Dec. 1974; 4 ♂ 4 ♀ Meander River, Deloraine, 28 Nov. 1974; 1 ♀ Bluff Hill Creek 12 km S of Marrawah, 30 Nov. 1974; 1 ♂ 3 ♀ Arthur River bridge 15 km SW of Roger River, 29 Nov. 1974; 2 ♂ Dip River Falls, 1 Dec. 1974; 7 ♂ 1 ♀ Duck River 6 km SW of Roger River, 29 Nov. 1974; 1 ♂ 1 ♀ Wilson Creek nr. Hellyer, 29 Nov. 1974; 4 ♂ 4 ♀ Mersey River trib. 4 km W of Liena, 15 Dec. 1974; 16 ♂ 1 ♀ Liffey River 5 km W of Liffey, 2 Dec. 1974; 1 ♂ Wilmot River 10 km S of Forth, 13 Dec. 1974; 11 ♂ 5 ♀ Quamby Brook 1 km E of Golden Valley, 16 Dec. 1974; 4 ♂ 2 ♀ Isis River nr. Auburn, 4 Dec. 1974; 17 ♂ 7 ♀ Black Bobs Creek 15 km NW of Ouse, 9 Dec. 1974; 39 ♂ 21 ♀ Bulls Creek, Cradle Mtn. Road, 13 Dec. 1974; 2 ♂ 1 ♀ Derwent River 3 km W of New Norfolk, 7 Dec. 1974; 21 ♂ Plenty River 6 km E of Moogara, 7 Dec. 1974; 1 ♀ Strickland Ave., Hobart, 8 Dec. 1974; 4 ♂ 4 ♀ Lilydale, creek 2 km N, 16 Dec. 1974. All specimens collected by A. Neboiss unless stated otherwise (NMV). 48 ♂ 27 ♀ North Esk River 20 E Launceston, 1 Mar. 1967, E. F. Riek (ANIC); 6 ♂ 27 ♀ Hellyer Gorge, 4 Feb. 1967, E. F. Riek (ANIC).

**Other recorded localities:** Tasmania—Port Arthur.

**Discussion:** Jacquemart (1965b) published a description of '*Synagapetus tasmanicus* sp. n.' with the 'Holotype ♂ from Burnie 26.x.1922'. In the same publication on p. 3 and in the legend for fig. 32 he has quoted Kimmins as the author of the species. From the text, figures and the examination of the specimen, which is mounted on three microscope slides, it is quite obvious that it must be referred to Mosely's species (Neboiss, 1974c).

**Distribution:** Tasmania—all provinces.

### 31 *Agapetus* (*Synagapetus*) *cralus* (Mosely) Figures 153-159

*Synagapetus crala* Mosely in Mosely and Kimmins, 1953:500.

*Agapetus* (*Synagapetus*) *crala*, Ross, 1956:161.

*Synagapetus styliferus* Jacquemart, 1965b:37. **syn. nov.**

Small, dark brown to blackish species, somewhat darker in appearance than *A. tasmanicus*. According to Ross (1956) this species belongs to the complex where in the male the anterior margin of segment 9 is angulate or produced near the midlateral line; and appear to represent the most primitive complex of *Agapetus* in Australia.

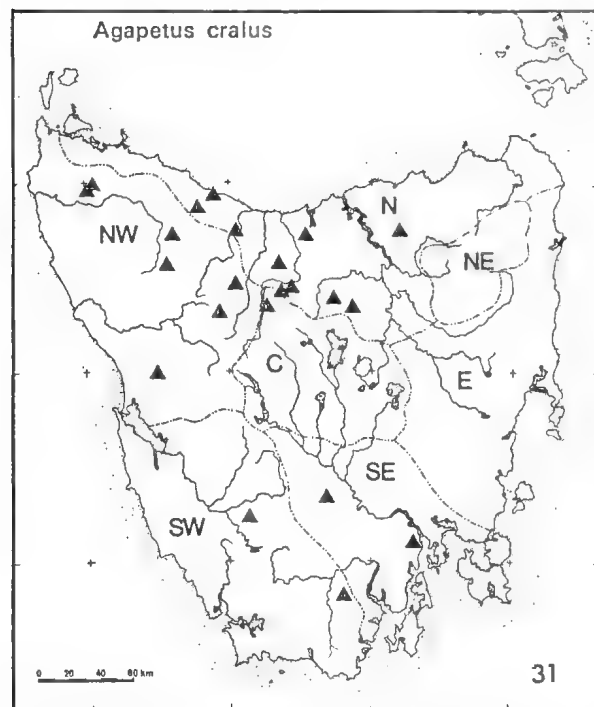
The present author, after careful examination of the holotype, failed to find sufficient dif-

ferences between *Synagapetus styliferus* Jacq. and *cralus* Mos. to warrant its retention as a separate species and therefore *styliferus* is now regarded as a synonym of *cralus*.

♂ *genitalia*: The upper margin of segment 10 not turned inward as much as in *tasmanicus*; superior appendages short, stout, somewhat clavate; inferior appendages in lateral aspect elongate oval, longitudinally curved, apex rounded, inner surface with curved ridge terminating with inwardly directed, triangular tooth near the apex. Strong, slightly curved ventral process on sternite 6.

♀ *genitalia*: segment 8 chitinized; a pair of slender, internal, anteriorly directed rods, longer than the segment itself, arise from the lateral pore; neither a ventral keel nor ventral process is present; segments 9 and 10 membranous; segment 9 with a pair of very long, anteriorly directed internal rods; segment 10 small, terminating with a pair of slender, two-segmented cerci. Ventral process on sternite 6 small; mid-tibia and tarsus strongly dilated.

*Length of anterior wing*: ♂ 4-5 mm; ♀ 4.5-5.25 mm.



*Type material: Synagapetus crala* Mosely. Type ♂ Cradle Mtn. Tas. 21 Jan. 1917, R. J. Till-

yard (BMNH). Type not seen.

*Synagapetus styliferus* Jacquemart. Holotype ♂ Geeveston, Tas., 4 Feb. 1923, A. Tonnoir (IRScNB), mounted on four microscope slides, type seen. Date doubtful, Tonnoir collected at Geeveston from 4 to 7 Dec. 1922—Neboiss (1974c).

*Material examined*: Tasmania—17 ♂ 3 ♀ Russell Falls, Nat. Park, 23 Feb. 1967; 1 ♂ same loc., 5 Dec. 1972, P. Zwick; 1 ♂ Tyenna River, National Park, 6 Dec. 1972, P. Zwick; 1 ♂ Strickland Ave., Hobart, 22 Feb. 1967; 28 ♂ 6 ♀ same loc., 8 Dec. 1974; 2 ♂ Mt. Wellington, 8 Dec. 1974; 38 ♂ 2 ♀ (1 pair in cop.) Sassafras Creek 4 km W of Mole Creek, 17 Nov. 1972; 6 ♂ same loc., 8 Dec. 1972, P. Zwick; 4 ♀ Minnow River, Paradise, 17 Nov. 1972; 17 ♂ 2 ♀ Burnie, 18 Nov. 1972; 6 ♂ Hellyer River Gorge, 5 Nov. 1972; 8 ♂ same loc., 2 Dec. 1972, P. Zwick; 2 ♀ same loc., 12 Dec. 1974; 2 ♀ Guide River Falls nr. Ridgley, 18 Nov. 1972; 3 ♂ 16 ♀ Leven River nr. Heka, 17 Nov. 1972; 1 ♀ Henty River 12 km NW of Queens-town, 12 Feb. 1971; 7 ♂ Eckberg Creek 12 km SW of Roger River, 29 Nov. 1974; 3 ♂ Duck River 6 km SW of Roger River, 29 Nov. 1974; 1 ♂ Snake Creek area, Fisher River Road, 15 Dec. 1974; 1 ♂ Dove River, Cradle Mtn. Nat. Park, 14 Dec. 1974; 1 ♂ Rubicon River 8 km SE of Sassafras, 2 Dec. 1974; 6 ♂ nr. Marakoopa Caves, 15 Dec. 1974; 8 ♂ 1 ♀ Quamby Brook 1 km E of Goulburn Valley, 16 Dec. 1974; 3 ♂ 3 ♀ Lilydale, creek 2 km N, 16 Dec. 1974; 32 ♂ 4 ♀ Liffey River 5 km W of Liffey, 2 Dec. 1974; 2 ♂ Bulls Creek, Cradle Mtn. Road, 13 Dec. 1974. All specimens collected by A. Neboiss unless stated otherwise (NMV). 1 ♂ Fossey River 10 mls S Hellyer Gorge, 5 Feb. 1967, E. F. Riek (ANIC); 1 ♂ Wedge River 30 mls W Maydena, 25 Feb. 1967, E. F. Riek (ANIC); 1 ♂ 2 ♀ Russell Falls, 23 Feb. 1967, E. F. Riek (ANIC).

*Distribution*: Tasmania—N, C, NW, SW and SE provinces.

### 32 *Agapetus (Synagapetus) laparus* sp. n.

Figures 160-165

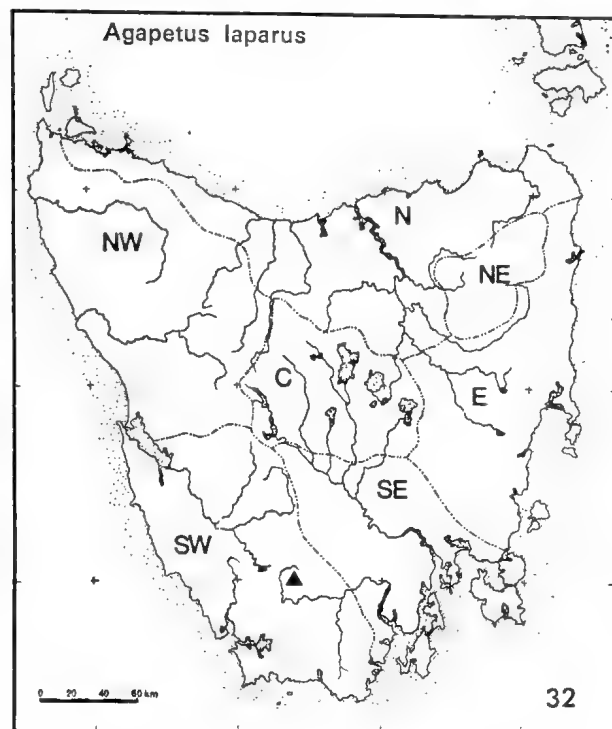
This small, brownish species appears to be closely related to *A. cralus*, but it is somewhat paler in colour and differs mainly in the male genitalia as shown in the figures. This species so far is known only from the type locality.

♂ *genitalia*: The anterior margin of segment 9 is produced at the midlateral line to a blunt lobe; tergite 10 rather short; superior appendages stout, short and in lateral aspect spatulate with a group of long setae; inferior appendages short, tapering to a rounded apex in lateral aspect, but somewhat more slender than in *cralus* in ventral aspect, the inner ridge terminating in a strong, triangular tooth near

apex. There is no ventral process present on sternite 6.

♀ unknown.

Length of anterior wing: ♂ 4-4.25 mm.



*Type material:* Holotype ♂ (T5220), 2 ♂ paratypes (T5221-T5222) Condominion Creek nr. Mt Anne, Tas., 9 Feb. 1965, A. Neboiss (NMV); 3 ♂ paratypes (T5223-T5225) Condominion Creek, Tas., 15 Feb. 1971, A. Neboiss (NMV).

*Distribution:* Tasmania—SW province.

### 3 Family HYDROPTILIDAE Stephens (1836)

The species of this family are among the smallest of all Trichoptera, usually measuring only 3 to 4 mm in length. They are known to occur in all parts of the world and are present in most unpolluted waters, with particular preference for clean, running streams.

Because of their small size, they are rarely collected by anyone except a specialist. Only eight species have been recorded in Australia so far, of which only one is from Tasmania. The classification of the family is still not satisfactory, even in regions where they are known

quite extensively. In this publication only a small number of species is described, although several more exist among the collected material, but the small number of specimens in each of these species, have been considered insufficient for their description.

*Family diagnosis:* Ocelli either present or absent, according to genus. Maxillary palpi 5-segmented in both sexes, first two segments very short, terminal segment simple. Antennae shorter than anterior wings; shorter in females than in males; basal segment not as long as the head. Wings elongate, slender, usually acute at tips, densely covered with fine pubescence, fringe on both wings longer than the width of the wing, particularly so, in posterior wings. Mesoscutum without warts; scutellum forming a flat, triangular area with steep sides.

Spurs 0:2:4; 0:3:4.

The first four larval instars are slender, free living and of short duration. In the fifth instar the larvae radically change their shape and construct purse-shaped cases.

#### KEY TO THE TASMANIAN GENERA

1. Spurs 0:2:4 . . . . . 2
- Spurs 0:3:4 . . . . . 3
2. Ocelli present; head of male without scent organ caps . . . . . *Orphninostrichia*
- Ocelli absent; head of male with scent organ caps . . . . . *Hydroptila*
3. Ocelli present . . . . . 4
- Ocelli absent . . . . . *Targatrichia*
4. Anterior wings without fork 3, abdominal segment 9 in female short . . . . . 5
- Anterior wings with fork 3 present; abdominal segment 9 in female extended, slender . . . . . *Maydenoptila*
5. Anterior wings fork 1 present; cross-vein r-m at base of fork on M; posterior wings with fork 2 present . . . . . *Hellyethira*
- Anterior wings without fork 1; cross-vein r-m basad of the base of fork on M; posterior wings without fork 2 . . . . . *Trichoglène*

#### Genus *Orphninostrichia* Mosely

*Orphninostrichia* Mosely, 1934:138; Mosely and Kimmins, 1953:510.

*Type species: Orphninostrichia maculata* Mosely, 1934.

Ocelli present. Anterior wings with forks 1 (?) and 2 present, fork 3 absent; cross-vein r-m at the base of fork on M. Posterior wings with forks 2 and 5 present. Antennae stout, consisting of about 30 segments; basal segments barely longer than the subsequent ones.

Spurs 0:2:4.

At present only one species is recorded from Tasmania, which differs from the New South Wales species *maculata* by details of male genitalia.

### 33 *Orphninostrichia acta* sp. n.

Figures 166-173

Wings densely covered with long, black pubescence; the anterior wings with small patch of white hairs at the middle of posterior margin. The pubescence dorsally and the fringe on wings in closed position under some light conditions show metallic greenish or bluish sheen. Antennae with 29-31 segments.

♂ genitalia with tergite 9 deeply excised dorsally, inner apical angles obtuse. Segment 10 membranous, broad at base, tapered distally, apex laterally compressed; lower apical angles produced into downcurved finger-like processes. Phallus long, slender, apex dilated, with small median excision. Apical margin of sternite 8 rounded, slightly produced at middle.

Sternite 3 with longitudinal median ridge. Ventral process on sternite 7 absent.

♀ abdomen with segments 9 and 10 of about the same length, the latter dorso-ventrally compressed; cerci short.

*Length of anterior wing:* ♂ 3-3.5 mm; ♀ 3-5 mm.

*Type material:* Holotype ♂ (T4997), allotype ♀ (T4998), 12 ♂ paratypes (T4999-T5010) Ulverstone, 4 km NW waterfalls, Tas., 18 Nov. 1972, A. Neboiss (NMV).

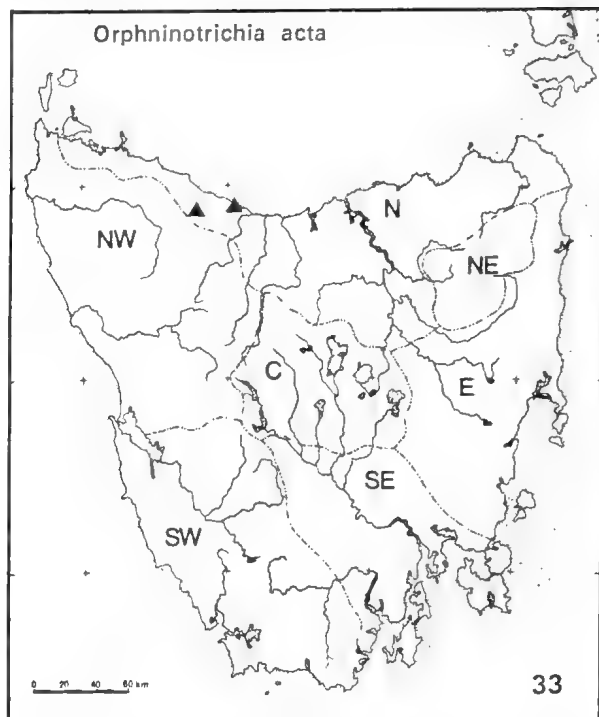
*Other material examined:* Tasmania—7 ♂ 1 ♀ Guide River Falls nr. Ridgley, Tas., 18 Nov. 1972, A. Neboiss (NMV).

*Distribution:* Tasmania—N province.

#### Genus *Hydroptila* Dalman

*Hydroptila* Dalman 1819:125; Ulmer, 1907:222; Moseley and Kimmins, 1953:505.

*Type species: Hydroptila tineoides* Dalman, 1819.



Ocelli absent. Head dorsally with a pair of lobes, which in some species in the males cover membraneous filaments, or they are lined with membrane, which is covered with minute androconia. Antennae stout, always shorter in females, segments short, about equal in length, individual segments covered with dark or light coloured hairs.

Anterior wings lanceolate, subacute, densely pubescent; cross-vein r-m at or slightly distad of base of fork on M; apical forks 2 and 3 present (interpreted by McLachlan 1880:510), and according to the interpretation of Mosely and Kimmins (1953), fork 1 also is present. Posterior wings with fringe more than twice the greatest width of the wing, fork 2 present, small.

Spurs 0:2.4.

So far two species are recorded from Tasmania. They are separated by the details of male genitalia.

### 34 *Hydroptila tasmanica* Mosely

*Hydroptila tasmanica* Mosely, 1934:147; Mosely and Kimmins, 1953:509.

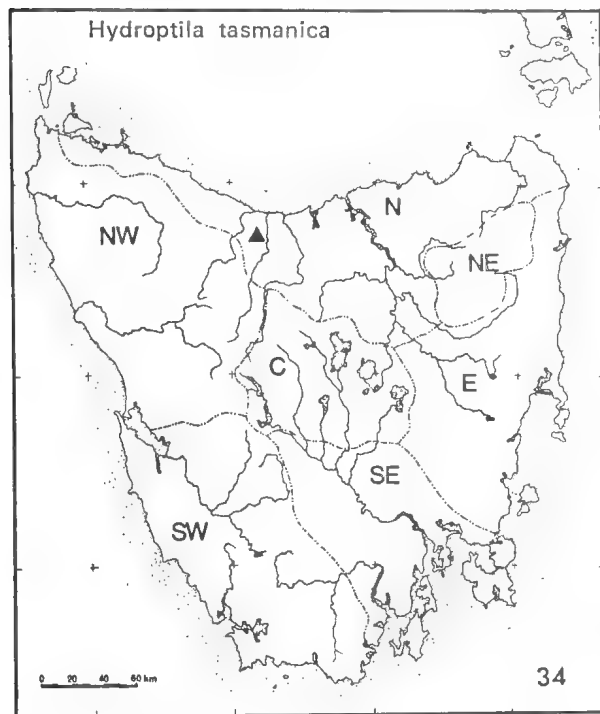
Anterior wings light fuscous, fringe fuscous with a white patch towards the apex. Antennae 29 segmented in male, pale fuscous. The wing

venation and male genitalia have been illustrated in the original description.

♂ genitalia with long, bifurcate dorsal plate, in dorsal view each branch dilated and obliquely truncate at apex. Phallus very long, slender, without the usual wrapped-around process near the apex. Small ventral process on sternite 7.

♀ unknown.

Length of anterior wing: ♂ 3 mm.



*Type material:* Type ♂ Wilmot, Tas., 9 Jan. 1917 (BMNH). Type not seen.

No new material has been available for study.  
*Distribution:* Tasmania—N province.

### 35 *Hydroptila scamandra* sp. n.

Figures 174-176

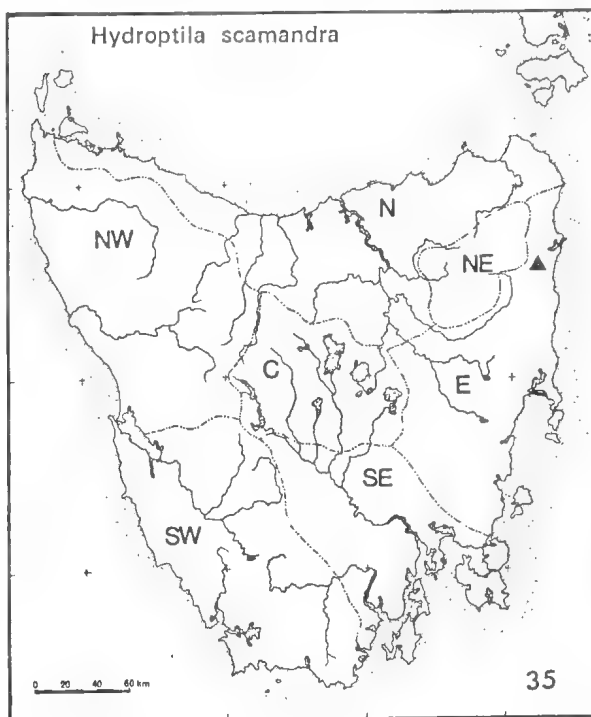
Anterior wings densely pubescent, mottled, greyish-brown. Antennae 28-segmented, 17 basal segments dark, followed by two whitish segments and 9 dark terminal segments, the last being much smaller than the preceding ones.

♂ genitalia with tergite 9 short, segment 10 elongate, triangular. Phallus long, slender, with wrapped around, strap-like process near the apex. Inferior appendages in lateral view clavate; a small protuberance near the apex and a

row of a few small teeth on the inner margin.

♀ unknown.

Length of anterior wing: ♂ 2.5 mm.



*Type material:* Holotype ♂ (T5011), 1 ♂ paratype (T5012) Scamander River, Upper Scamander, Tas., 9 Nov. 1972, A. Neboiss (NMV).

*Distribution:* Tasmania—E province.

### Genus *Targatrichia* gen. n.

*Type species:* *Targatrichia zonata* gen. et sp. n.

Ocelli absent. Antennae 28 to 32 segmented, apical segments with dark and light colour pubescence, producing zoned appearance, Anterior wings without anal lobe, apical forks 1, 2 and 3 present, fork 1 with long footstalk. Posterior wings with fork 2 only.

Spurs 0:3:4.

Only one species included in this genus.

### 36 *Targatrichia zonata* sp. n.

Figures 177-181

Anterior wings densely covered with long hairs and erect setae, general colour brownish with subdued mottling; cross-vein r-m distad

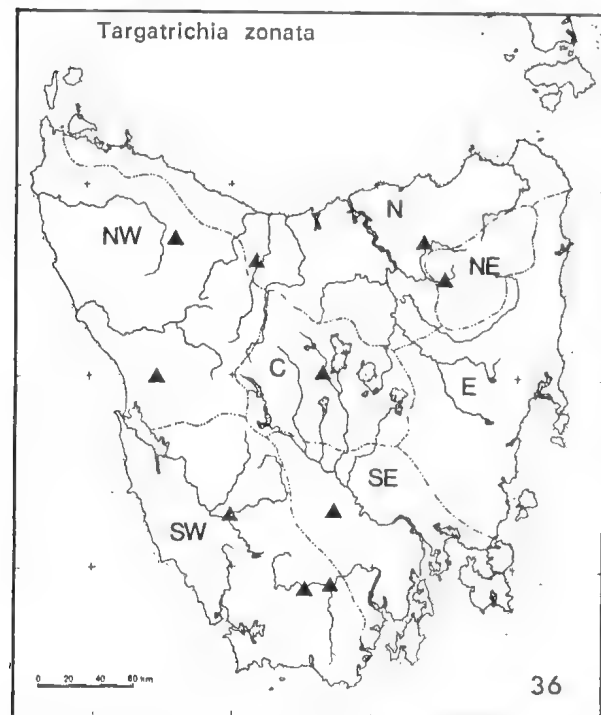


of the base of fork on M. Antennae usually 32 segmented in males, 28 segmented in females, basal 18-22 segments dark, the 11 apical segments always show the same colour pattern with two pale, four dark, two pale and terminating with three dark segments.

♂ *genitalia*: sternite 9 produced downward into a distinct lobe, apically cleft in the middle; segment 10 asymmetrical, semimembraneous. Phallus long, very slender, with a small apical loop. A small ventral process on sternite 6, more robust and slightly longer process on sternite 7, covered with a group of strong, blunt, peg-like, apically truncate spines.

♀ abdomen with terminal segments short, sternite 8 with deep median cleft, at the base of which arises a small, posteriorly directed tubercle; segment 10 bearing a pair of slender cerci.

*Length of anterior wing*: ♂ 3.5-3.75 mm; ♀ 3.5-4 mm.



*Type material*: Holotype ♂ (T5013), allotype ♀ (T5014), 6 ♂ 12 ♀ paratypes (T5015-T5032) St. Patricks River, Targa, Tas., 22 Feb. 1971, A. Neboiss (NMV).

*Other material examined*: Tasmania—1 ♂ 1 ♀ National Park, Tyenna River, 20 Feb. 1967; 1 ♂ 2 ♀

North Esk River, Blessington, 1 Mar. 1967; 17 ♂ 5 ♀ Henty River 12 km NW Queenstown, 10 Feb. 1971; 105 ♂ 45 ♀ Huon-Picton River junction, 18 Feb. 1967; 9 ♀ Hellyer River Gorge, 9 Feb. 1971; 4 ♀ Huon River nr. Blakes Opening, 9 Feb. 1966. All specimens collected by A. Neboiss (NMV). 71 ♂ 34 ♀ Huon-Picton junction, 17 Feb. 1967; 1 ♂ 2 ♀ Forth Falls, 28 Jan. 1967; 2 ♂ 3 ♀ Ouse River 8 km W Miena, 28 Feb. 1967; 4 ♀ Gordon River (Strathgordon) 50 mls W Maydena, 26 Feb. 1967; 42 ♂ 56 ♀ Hellyer Gorge, 4 Feb. 1967. Collected by E. F. Riek (ANIC).

*Distribution*: Tasmania—N, NE, C, NW, SW and SE provinces.

### Genus *Hellyethira* gen. n.

*Type species*: *Hellyethira valleculea* gen. et sp. n.

Ocelli present. Anterior wings with forks 1 and 2 present, fork 3 absent; cross-vein r-m at the base of fork on M. Posterior wings with fork 2 present, but very small. This genus is very close to the New Zealand genus *Paroxyethira* from which it is separated by presence of foot-stalk on fork 1 and distinguished from genus *Orthotrichia* by absence of fork 3 in the anterior wings. Antennae long, consisting of about 40 segments in males; basal segment slightly enlarged, rounded.

Spurs 0:3:4.

### 37 *Hellyethira valleculea* sp. n.

Figures 182-187

Anterior wings mottled, without anal lobe, forks as described in generic diagnosis. Antennae in male 42 segmented, basal 21 segments pale, followed by 16 dark and terminal 5 pale again; usually two segments occupy the transgression zone from pale to dark segments; in females there is a total of about 34 segments, basal 19 segments pale, 11 dark and terminal 4 pale, although the numbers could vary slightly.

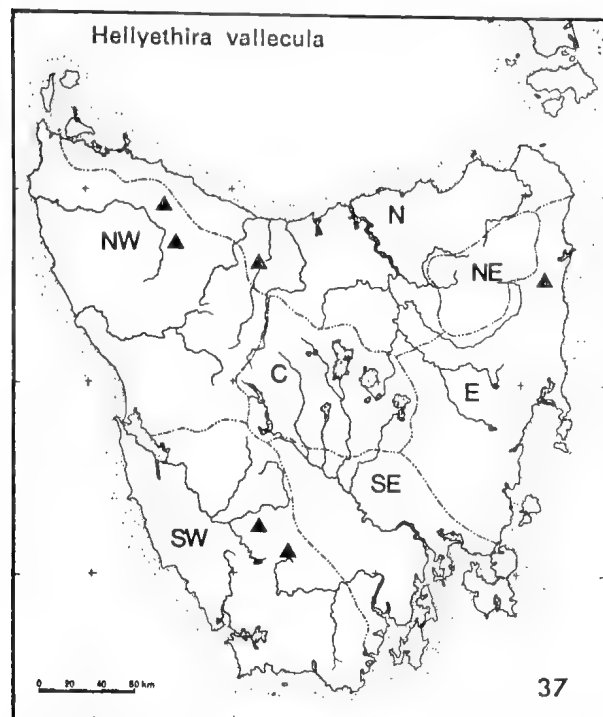
♂ *genitalia* very short and compact, segment 9 laterally extended to a triangular, slightly curved lobe, ventral margin apically widely concave. Segment 10 membranous, broad at base, truncate apically. Inferior appendages short, curved inwards. Phallus long, tubular, basally constricted near apex, spiral process wrapped around the central tube. Small ventral process on sternite 7.

♀ abdomen with apical margin of segment 8 ventro-laterally produced into a pair of



small, rounded lobes. Terminal segment slightly compressed dorso-ventrally; a pair of small cerci at lower margins.

*Length of anterior wing:* ♂ 3.75 mm; ♀ 3.5 mm.



*Type material:* Holotype ♂ (T5033), allotype ♀ (T5034), 2 ♂ 3 ♀ paratypes (T5035-T5039) Hellyer River Gorge, Tas., 9 Feb. 1971, A. Neboiss (NMV); 1 ♂ paratype (T5040) Wedge River 30 mls W Maydena, Tas., 26 Feb. 1967, A. Neboiss (NMV); 1 ♂ paratype (T5041) Huon River Crossing, Tas., 16 Feb. 1971, A. Neboiss (NMV); 1 ♀ paratype Hellyer River Gorge, Tas., 4 Feb. 1967, E. F. Riek (ANIC).

*Other material examined:* Tasmania—2 ♂ 1 ♀ Scamander River, Upper Scamander, 9 Nov. 1972, A. Neboiss (NMV); 1 ♀ Flowerdale River, Meunna, 4 Nov. 1972, A. Neboiss (NMV); 2 ♂ 2 ♀ Forth Falls, 28 Jan. 1967, E. F. Riek (ANIC).

*Distribution:* Tasmania—E, N, NW and SW provinces.

Genus **Trichoglène** gen. n.

*Type species:* *Trichoglène columba* gen. et. sp. n.

Ocelli present. Eyes covered with short setae. Antennae slender, 28 to 33 segmented, with-

out colour differences between segments. Both wings very slender; anterior wings with forks 2 and 3 present, cross-vein r-m basad of base of fork on M; posterior wings without apical forks.

Spurs 0:3:4.

Only one species has been included in the genus.

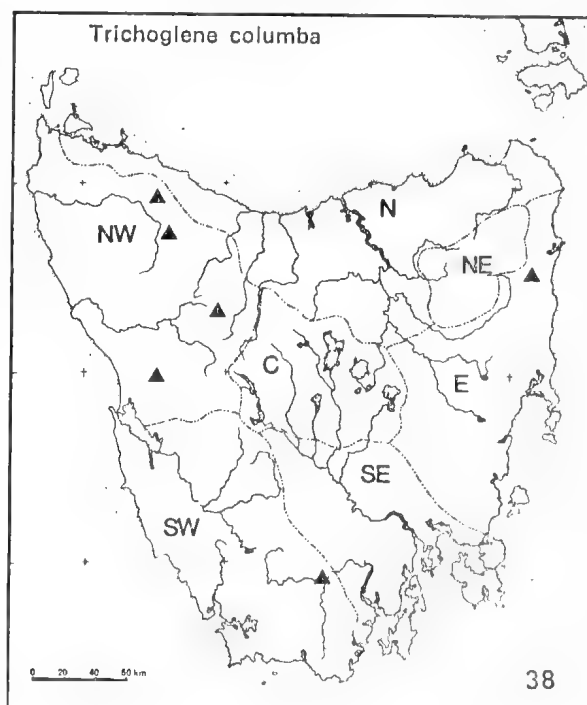
### 38 *Trichoglène columba* sp. n.

Figures 188-193

Wings covered with long pubescence, anterior wings brownish, with indistinct transverse, dark and pale bands; posterior wings with fringe more than twice the greatest width of the wing, apical forks absent. Antennae 30-33 segmented in males, 28-30 segmented in females.

♂ genitalia with segment 9 deeply and widely excised dorsally, forming a pair of concave dorsal lobes; a pair of shorter, apically truncate lobes formed by ventral margin; lower section of anterior margin produced forward nearly to the segment 7; between the dorsal and ventral lobes arises membranous, finger-like process.

♀ abdomen terminates with short segments 9 and 10, the latter with a pair of slender cerci.



*Length of anterior wing:* ♂ 2.5-2.75 mm; ♀ 2.5 mm.

*Type material:* Holotype ♂ (T5042), allotype ♀ (T5043), 20 ♂ 3 ♀ paratypes (T5044-T5066) Dove River, Cradle Mtn Nat. Park, Tas., 14 Dec. 1974, A. Neboiss (NMV).

*Other material examined:* Tasmania—29 ♂ 6 ♀ Huon-Picton River junction, 15 Nov. 1972, A. Neboiss (NMV); 3 ♂ Hellyer River Gorge, 9 Feb. 1971, A. Neboiss (NMV); 31 ♂ 9 ♀ Flowerdale River, Meunna, 4 Nov. 1971, A. Neboiss (NMV); 2 ♂ Henty River 12 km NW of Queenstown, 10 Feb. 1971, A. Neboiss (NMV); 5 ♂ Scamander River, Upper Scamander, 9 Nov. 1972, A. Neboiss (NMV); 12 ♂ Hellyer Gorge, 4 Feb. 1967, E. F. Rick (ANIC).

*Distribution:* Tasmania—E, NW and SW provinces.

### Genus *Maydenoptila* gen. n.

*Type species:* *Maydenoptila cuneola* gen. et sp. n.

Ocelli present. Wings rather broad, lanceolate; anterior wings with small, rounded anal lobes, forks 1, 2 and 3 present; posterior wings with forks 2, 3 and 5 present; fringe moderately long, less than twice the greatest width of the wing. Antennae slender, 38-42 segmented in males; 28-33 segmented in females, the two basal segments enlarged, terminal segment longer than the preceding one. In females the abdomen gradually tapered, segment 9 slender, segment 10 small, conical.

Spurs 0:3:4.

Two Tasmanian species are included in this genus.

#### KEY TO THE SPECIES OF *MAYDENOPTILA*

1. Anterior wing, fork 2 short, about as long as fork 3 . . . . . *rupina*
- Anterior wing, fork 2 long and narrow, about twice as long as fork 3 . . . *cuneola*

### 39 *Maydenoptila cuneola* sp. n.

Figures 194-197; 203

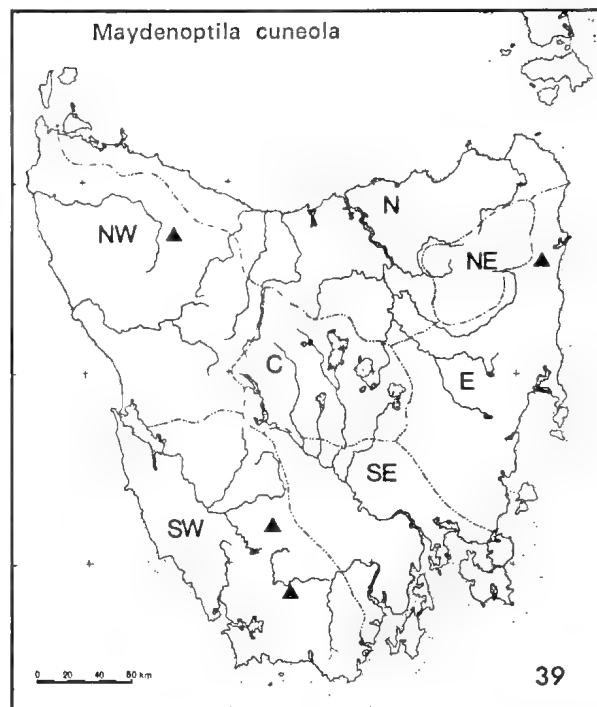
Anterior wings brownish, with more or less distinct pale transversal line at about the middle; fork 2 very long and narrow, about twice as long as fork 3, reaching basally beyond the base of forks 1 and 3. Posterior wings with forks 2, 3 and 5 present; fork 2 very long and narrow, about twice as long as fork 3. Antennae

unicolorous, 42-segmented in male, terminal segment conical, slightly longer than the preceding segment; in females about 33-segmented.

♂ genitalia with segment 9 deeply and widely excised dorsally, small protuberances at the upper distal angle apparently represent superior appendages; basal margin mid-ventrally extended into apically rounded lobes. Segment 10 long, broad at base, bluntly triangular at apex. Phallus parallel-sided, slightly curved downwards. Inferior appendages large, robust, two-branched; upper branch elongate, rounded apically, with a curved process on inner surface, lower branch broad, with group of strong spines on inner surface. Small ventral process on sternite 7.

♀ abdomen from segment 5 gradually tapers posteriorly; small ventral process on sternite 6; segment 10 small, conical, with a pair of slender cerci.

*Length of anterior wing:* ♂ 3.5-4 mm; ♀ 4 mm.



*Type material:* Holotype ♂ (T5067), allotype ♀ (T5068), 9 ♂ 3 ♀ paratypes (T5069-T5080) Wedge River, Tas., 17 Feb. 1971, A. Neboiss (NMV); 1 ♂ 2 ♀ paratypes, Wedge

River 30 mls W Maydena, Tas., 25 Feb. 1967, E. F. Riek (ANIC).

*Other material examined:* Tasmania—1 ♂ Cra-croft River, 8 Feb. 1966, A. Neboiss (NMV); 1 ♂ Scamander River, Upper Scamander, 9 Nov. 1972, A. Neboiss (NMV); 1 ♂ 2 ♀ Hellyer River Gorge, 9 Feb. 1971, A. Neboiss (NMV); 6 ♂ 4 ♀ same loc., 4 Feb. 1967, E. F. Riek (ANIC).

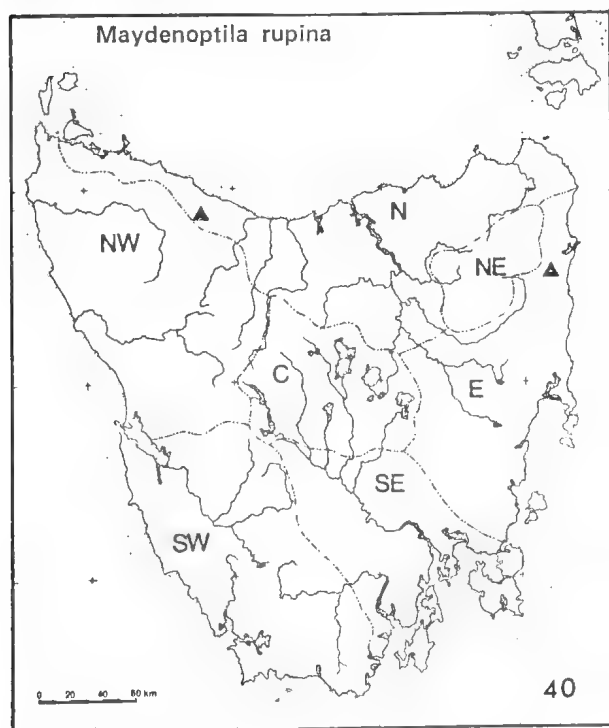
*Distribution:* Tasmania—NW, SW and E provinces.

#### 40 *Maydenoptila rupina* sp. n.

Figures 198-202

Anterior wings greyish-brown with some mottling; fork 2 in both wings about the same length as fork 3. Antennae in males 38-segmented, terminal segment distinctly longer than the preceding segment; in females about 28-30 segmented.

♂ genitalia with basal margin of segment 9 mid-ventrally extended and broadly rounded; distally truncate. Segment 10 somewhat bluntly triangular. Phallus tapers to slender apex. Inferior appendages robust, two-branched; upper branch elongate, clavate apically, with a curved process on inner surface, lower branch broad, curved inwards, inner apical angle slightly produced. Small ventral process on sternite 7.



♀ abdomen gradually tapers, segment 8 short, segment 9 slender, segment 10 short, somewhat conical, with a pair of small cerci. *Length of anterior wing:* ♂ 2.5-3 mm; ♀ 3 mm.

*Type material:* Holotype ♂ (T5081), allotype ♀ (T5082), 20 ♂ 8 ♀ paratypes (T5083-T5110), Guide River Falls nr. Ridgley, Tas., 18 Nov. 1972, A. Neboiss (NMV); 3 ♂ paratypes (T5111-T5113) Scamander River, Upper Scamander, Tas., 9 Nov. 1972, A. Neboiss (NMV).

*Distribution:* Tasmania—E and N provinces.

#### SUPERFAMILY HYDROPSYCHOIDEA

Maxillary palpi with terminal segment annulated, flexible. Larvae compodeiform, retreat makers and net-builders.

#### 4 Family PHILOPOTAMIDAE Wallengren (1891)

*Family diagnosis:* Ocelli present; maxillary palpi five-segmented in both sexes, segment 5 long, flexible. Mesoscutum with setiferous punctures, which are sometimes reduced, never with a pair of warts.

Spurs 1:4:4 or 2:4:4; fore tibia never with subapical spur. Anterior wings with  $R_1$  simple; apical forks 1, 2, 3, 4 and 5, or 1, 2, 3 and 5 present; posterior wings with forks 1, 2, 3 and 5, or 2, 3 and 5 present; discoidal cell always present in both wings.

Two genera has so far been recorded from Australia, of which only one—*Hydrobiosella* Tillyard—occurs in Tasmania. Ross (1956) regarded this as one of the seven subgenera of *Sortosa* Navas (= *Dolophiloides* Ulmer, 1909) each one of which was apparently restricted to a single zoogeographic region. These groups are morphologically distinct and separable, and as more species have been discovered, there is sufficient evidence to retain the previously applied name *Hydrobiosella* at the generic level for the Australian and New Zealand group of species.

#### Genus *Hydrobiosella* Tillyard

*Hydrobiosella* Tillyard, 1924:288; Mosely and Kimmins, 1953:387; Riek, 1970:757

*Sortosa* subgenus *Hydrobiosella*, Ross, 1956:30.

*Dolophiloides* subgenus *Hydrobiosella*, Wise, 1973:172.

*Type species: Hydrobiosella stenocerca* Tillyard, 1924.

The genus is confined to Australia and New Zealand with one species in New Caledonia. The Tasmanian species are all of medium size with wing span between 14 and 20 mm, dark grey to light-brownish, mottled with dull, greyish to bright yellow-brown.

Anterior wings with forks 1, 2, 3, 4 and 5 present; forks 1 and 2 sessile; cross vein between costa and subcosta at about middle of costal area; two cross veins between Sc and R, first near the R-Rs junction, the second near the distal end of discoidal cell. Posterior wings with forks 1, 2, 3 and 5 present; fork 1 usually sessile; three anal veins.

Maxillary palp with first segment short, second slightly longer, with a group of stiff bristles on the inner distal angle, third as long or longer than first two together, fourth shorter than third, fifth long and flexible.

Male genitalia distinctly elongate, with two-segmented inferior appendages. Female abdomen gradually tapers to a simple apex and terminates with a pair of small but distinct cerci. Segments 8 and 9 internally with slender apodemes.

Spurs 2:4:4.

A total of nine species are now recognized from Tasmania; five are described here as new, two of which (*corinna* and *orba*) show close affinities with the New Caledonian species *Hydrobiosella uncinata* Kimmins. Ross (1956) suggested that the primitive forms would have possessed short superior appendages (= cerci of Ross, 1956) and a complete set of anal veins in posterior wing. This situation is found in *H. corinna* as well as in *H. orba*, and these could therefore be regarded as primitive forms being closest to the *Hydrobiosella* ancestor type.

The Tasmanian species fall into three quite distinctive groups.

A. Four species with abdominal segment 9 entire, either joined or narrowly separated dorsally; posterior margin without lateral excision, superior appendages present in a form of small, simple processes; small, but distinct valvular structure present on sternite 5 in both sexes;

circular structure on sternite 4 in females present.

To this group belong *corinna*, *orba*, *cerula* and *anasina*.

B. Four species with abdominal segment 9 entire, either joined or narrowly separated dorsally; posterior margin with lateral excision; superior appendages present in form of more or less widened lobes; valvular structure present on sternite 5 in both sexes; circular structure on sternite 4 present in females.

To this group belong *tasmanica* and *armata* with well developed circular structure on sternite 4 and *sagitta* and *cognata* with poorly developed circular structure.

C. One species (*waddama*) with dorsal part of abdominal segment 9 membranous; superior appendages absent; valvular structures absent, circular structure on sternite 4 in females present.

It is interesting to note that of the nine Tasmanian species no less than eight are endemic; the only exception being *waddama*, which is also widely distributed in Victoria and New South Wales.

#### KEY TO TASMANIAN *HYDROBIOSELLA* SPECIES

(Males only)

1. Tergum of segment 9 membranous . . . . . *waddama*
- Tergum of segment 9 entirely or partly sclerotized . . . . . 2
2. Posterior margin of segment 9 without lateral excision . . . . . 3
- Posterior margin of segment 9 with lateral excision . . . . . 6
3. Segment 10 very long and slender, extending at least to base of harpago . . . . . 4
- Segment 10 at most extending as far as the middle of coxopodite . . . . . 5
4. Apex of segment 10 barely reaching base of harpago, widened at the lower angle . . . . . *anasina*
- Apex of segment 10 reaching beyond base of harpago, curved upward, without forming distinct angle . . . . . *cerula*
5. Segment 9 dorsally bridged by semi-membranous section; phallus short and stout . . . . . *orba*

- Segment 9 dorsally joined with narrow sclerotized bridge; phallus slender . . . . . *corinna*
- 6. Superior appendage broad, angular, with lower posterior angle extended into a long, upcurved spine . . . . . 7
- Superior appendage not angular, extended distally . . . . . 8
- 7. Apex of segment 10 in dorsal view short, triangular . . . . . *armata*
- Segment 10 with small, triangular lateral flanges, after which the sides gradually curve to a narrow rounded tip . . . . . *tasmanica*
- 8. Superior appendage extended distally to a finger-like, rounded process . . *cognata*
- Superior appendage extended distally to a strap-like, twisted process . . . *sagitta*

#### 41 *Hydrobiosella corinna* sp. n.

Figures 204-205

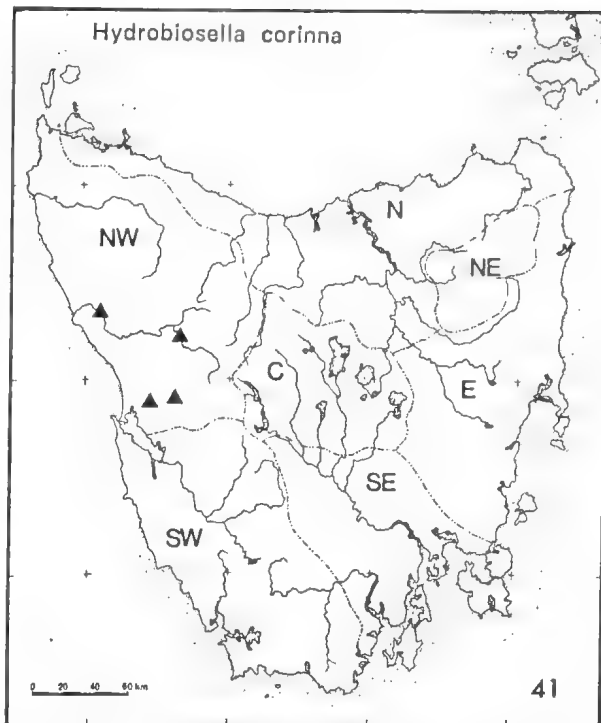
Anterior wings yellowish to greyish-brown, irregularly mottled, with pale and dark pubescence. Valvular structure on sternite 5 present in both sexes, and a circular structure on sternite 4 in females only.

♂ genitalia with segment 9 dorsally joined with a narrow, sclerotized bridge; posterior margin without lateral excision; segment 10 in dorsal view somewhat elongate triangular, gradually tapering to rather pointed, laterally compressed apex, posteriorly not extending beyond the middle of coxopodite. Superior appendages small, somewhat pointed. Phallus long, slender, cylindrical, a pair of 'V' shaped chitinous structures internally on ventral side. Inferior appendages slender, coxopodite almost twice the length of harpago, which is slightly curved inward, with a group of short, stout spines at the apex.

♀ abdomen gradually tapers towards the apex, which bears a pair of small cerci; lateral margin of sternite 7 without protuberances.

*Length of anterior wing:* ♂ 7.5-8.5 mm; ♀ 7.5-9 mm.

*Type material:* Holotype ♂ (T4480), allotype ♀ (T4481), 2 ♂ paratypes (T4482-T4483) Corinna, Tas., 5 Nov. 1972, A. Neboiss (NMV); 1 ♂ 2 ♀ paratypes (T4484-T4486)



King River, Tas., 5 Nov. 1961, N. Dobrotworsky (NMV).

*Other material examined:* 37 ♂ 6 ♀ 10 mls E Strahan, 6 Feb. 1967, E. F. Riek (ANIC); 1 ♂ Murchison River, 5 Feb. 1967, E. F. Riek (ANIC).

*Distribution:* Tasmania—NW province.

#### 42 *Hydrobiosella orba* sp. n.

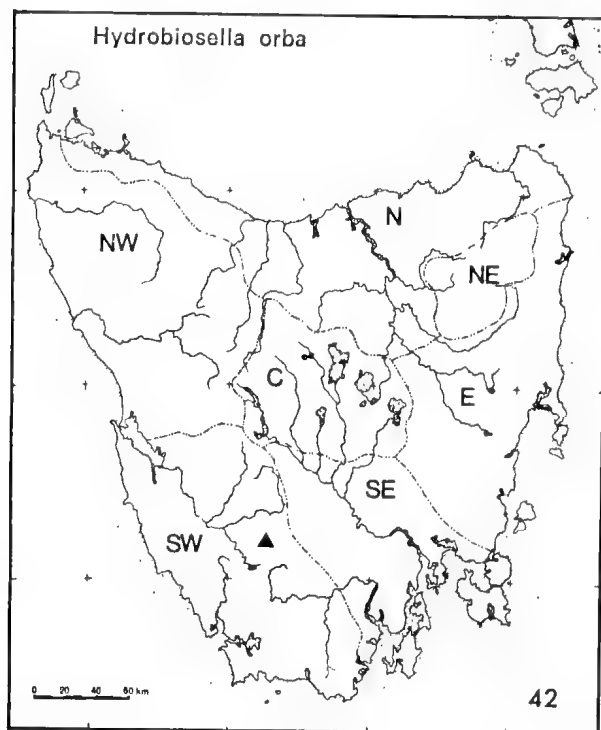
Figures 206-207

Anterior wings light yellowish-brown, mottled, pterostigma more distinct than in other species. Valvular structure on sternite 5 present.

♂ genitalia with segment 9 rather short, bridged dorsally with narrow, semi-membranous section, posterior margin without lateral excision. Segment 10 shorter than in *corinna*, elongate triangular, apex rounded and dorsally elevated. Superior appendages very short. Phallus short and stout, internally with a pair of V-shaped chitinous structures. Inferior appendages slender, coxopodite slightly less than twice the length of harpago, the latter curved inwards with a group of short, stout spines at the apex.

♀ unknown.

*Length of anterior wing:* ♂ 6 mm.



*Type material:* Holotype ♂ (T4479) Wedge River, Tas., 17 Feb. 1971, A. Neboiss (NMV).  
*Distribution:* Tasmania—SW province.

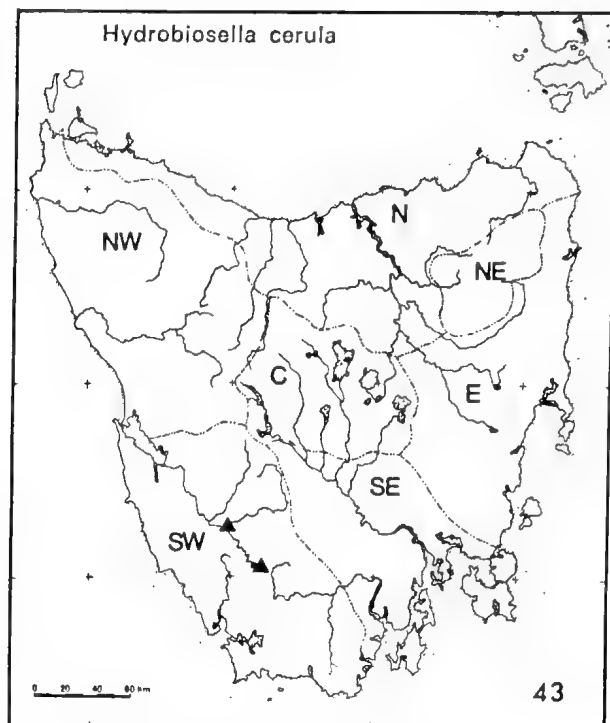
43 *Hydrobiosella cerula* sp. n.

Figures 208-209

Anterior wings light yellowish-brown, irregularly mottled. Wing venation typical of the genus, details of the cross-vein position shown in the figure. Valvular structure on sternite 5 present.

♂ genitalia with segment 9 in lateral view somewhat obliquely elongate; dorsally bridged by short, semi-membraneous section, posterior margin without lateral excision; segment 10 very long and slender, in dorsal view gradually tapering apically, extending beyond the base of harpago, the apex curved upwards. Superior appendages small, elongate lying close and parallel to the margin of segment 9. Phallus cylindrical, slightly curved downward, apex widened laterally. Inferior appendages long, rather stout; coxopodite about 2.5 times longer than harpago, the latter stout, armed with four to five strong, inwardly directed spines and a group of short, stiff bristles on inner angle.

♀ unknown.



*Length of anterior wing:* ♂ 7-8 mm.

*Type material:* Holotype ♂ (T4478) Lake Pedder, Tas., 10 Mar. 1972, A. Neboiss (NMV); 1 ♂ paratype Gordon River, Strathgordon 50 mls W Maydena, Tas., 26 Feb. 1967, E. F. Riek (ANIC).

*Distribution:* Tasmania—SW province.

44 *Hydrobiosella anasina* sp. n.

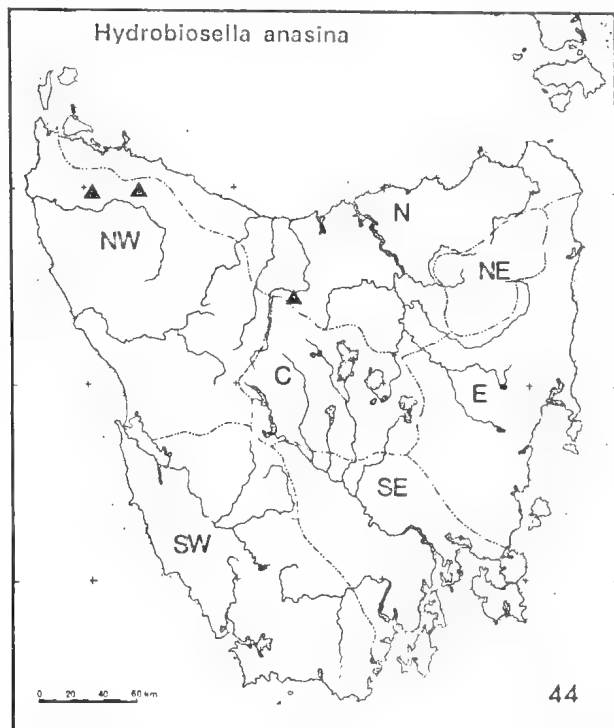
Figures 210-211

Anterior wings yellowish-brown, irregularly mottled. Valvular structure on sternite 5 present in both sexes, but circular structure on sternite 4 in females only.

♂ genitalia with segment 9 dorsally joined by a short, narrow chitinous ridge; posterior margin without lateral excision; segment 10 long and slender, but barely reaching the base of harpago, apex distinctly widened at the base of sharply upturned tip. Superior appendages small, lying close and parallel to the margin of segment 9, shorter than in *H. cerula*. Phallus cylindrical. Inferior appendages with coxopodite about twice as long as harpago, which is somewhat triangular in lateral view, a few stout, inwardly directed spines at apex and a group of stiff bristles on inner angle.

♀ abdomen gradually tapering towards the apex, which terminates with a pair of small cerci. At the middle of the lateral margin of sternite 7 there is a small, ridge-like protuberance.

*Length of anterior wing:* ♂ 7-9 mm; ♀ 7-8.5 mm.



*Type material:* Holotype ♂ (T5226), allotype ♀ (T5227), 14 ♂ 14 ♀ paratypes (T5228-T5255) Duck River 6 km SW of Roger River, Tas., 29 Nov. 1974, A. Neboiss (NMV).

*Other material examined:* Tasmania—1 ♂ Dip River Falls 10 km S of Mawbanna, 1 Dec. 1974, A. Neboiss (NMV); 1 ♂ nr. Marakoopa Caves, 15 Dec. 1974, A. Neboiss (NMV).

*Distribution:* Tasmania—N and NW provinces.

#### 45 *Hydrobiosella tasmanica* Mosely

Figures 212-217

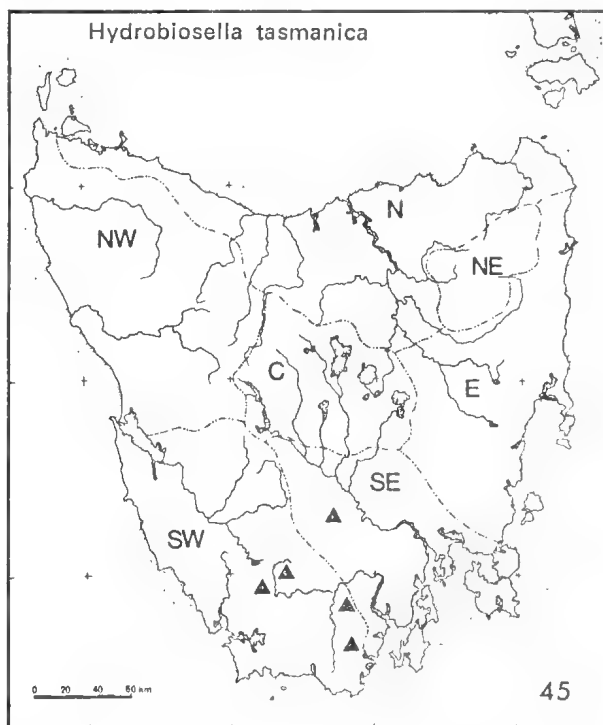
*Hydrobiosella tasmanica* Mosely in Mosely and Kimmins, 1953: 390.

Anterior wings yellowish to greyish-brown, irregularly mottled. Valvular structure on sternite 5 present in both sexes, in females circular structure on sternite 4 present and well developed.

♂ genitalia—segment 9 with tergal section short, separated from sternal section by lateral excision; segment 10 in dorsal view with small, triangular lateral flanges at about the middle of the segment, from there on the sides gradually curve to a narrow, rounded apex; dorsally at the base there is a pair of minute, flat, triangular protuberances. Superior appendages (= basal ridge or process of tenth tergite by Ross, 1956) broadly angular, upper posterior angle rounded, triangular, the lower posterior angle extended distally to a long, upcurved spine. Phallus slender, slightly curved downwards, with a pair of strong, ventrally directed spines at the apex, other internal, distally directed spines not always visible. Inferior appendages long, coxopodite about 1.5 times longer than harpago, the latter slightly curved inwards with groups of short, stout bristles at the apex.

♀ abdomen gradually tapers apically and terminates with a pair of small cerci; tergite 8 narrow, elongate triangular.

*Length of anterior wing:* ♂ 7.5-9.5 mm; ♀ 8-9.5 mm.



*Type material:* Holotype ♂ Tasmania, J. W. Evans (BMNH), without definite locality. Type seen.



*Material examined:* Tasmania—11 ♂ Russell Falls, Nat. Park, 23 Feb. 1967; 7 ♂ 3 ♀ same loc., 20 Feb. 1971; 4 ♀ same loc., 15 Nov. 1972; 2 ♂ 4 ♀ same loc., 5 Dec. 1972, P. Zwick; 1 ♂ 1 ♀ Arve River 10 km W Geeveston, 19 Feb. 1967; 4 ♂ 1 ♀ West Arthur Plains, 3 Feb. 1965; 19 ♂ 6 ♀ Condominion Creek, 9 Feb. 1965 and 15 Feb. 1971; 12 ♂ 2 ♀ Hot Springs Creek nr. Hastings Caves, 14 Nov. 1972. All specimens collected by A. Neboiss unless stated otherwise (NMV). 1 ♂ 4 ♀ Russell Falls, 23 Feb. 1967, E. F. Riek (ANIC).

Three ♂ paratypes were examined: it was found that the paratype ♂ from Cradle Mtn., 16 Jan. 1917, R. J. Tillyard (BMNH), is *Hydrobiosella cognata* Kimmins, and 2 ♂ paratypes Hobart, Dec. 1937, J. W. Evans, are *Hydrobiosella armata* Jacquemart. It is likely that the female from Hobart, Dec. 1937 and Mt Wellington 3700 ft., 7 Feb. 1942, J. W. Evans, are also *H. armata*, but the female from Waratah, collected by Lea, belongs to one of the three North West Tasmanian species.

*Distribution:* Tasmania—SW and SE provinces.

#### 46 *Hydrobiosella armata* Jacquemart

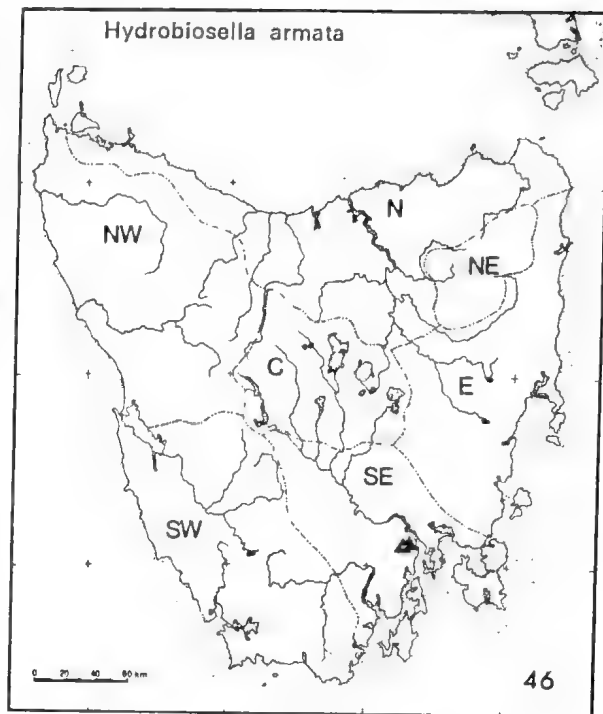
Figures 218-219

*Hydrobiosella armata* Jacquemart, 1965b:34.

Anterior wings pale yellowish to greyish-brown with irregular mottling. Closely related to *H. tasmanica*, but smaller in size and can be separated by the different shapes of the superior appendages and of segment 10. Valvular structure of sternite 5 present in both sexes; in females the circular structure on sternite 4 present, well developed.

♂ genitalia segment 9 short, on sides less produced anteriorly than in *H. tasmanica*, tergal section short, lateral excision shallow; segment 10 in dorsal view with small lateral flanges, apex bluntly triangular, a pair of minute elongate protuberances near the base present. Superior appendages squarish, lower margin extended distally to a long, upcurved spine, which is transversely grooved on the inner surface near the apex. Phallus stout, slightly widened at the apex, ventrally directed apical spines small. Inferior appendages with coxopodite somewhat less robust than in *H. tasmanica*.

♀ very close to *H. tasmanica*, but more material is required to establish morphological differences between the two species, although generally this is a slightly smaller species.



*Length of anterior wing:* ♂ 5.5-7 mm; ♀ 6-7 mm.

*Type material:* Holotype ♂ Mt Wellington, Tas., 20 Nov. 1922, A. Tonnoir (IRScNB). Mounted on three microscope slides; a label on one of these slides reads "Nouvelle Zelande, Mont Wellington 20.11.1922", not in Tonnoir's handwriting.

*Material examined:* Tasmania—1 ♂ 1 ♀ Strickland Ave., Hobart, 22 Feb. 1967, A. Neboiss (NMV); 3 ♂ 1 ♀ same loc. 8 Dec. 1974, A. Neboiss (NMV); 2 ♂ Mt Wellington, 8 Dec. 1974, A. Neboiss (NMV); 1 ♂ Strickland Ave., Hobart, 22 Feb. 1967, E. F. Riek (ANIC).

Two ♂ paratypes of *Hydrobiosella tasmanica* Mosely, labelled Hobart, Dec. 1937, J. W. Evans in BMNH collection, were re-examined and found to be *Hydrobiosella armata* (see above).

*Distribution:* Tasmania—SE province.

#### 47 *Hydrobiosella cognata* Kimmins

Figures 220-224

*Hydrobiosella cognata* Kimmins in Mosely and Kimmins, 1953:392; Jacquemart, 1965b:32 (erroneously as "sp. n."); Neboiss, 1974c:15.

*Hydrobiosella spinosa* Jacquemart, 1965b:33 *syn. nov.*

Anterior wings yellowish-brown with yellowish irregular mottling. Valvular structure on

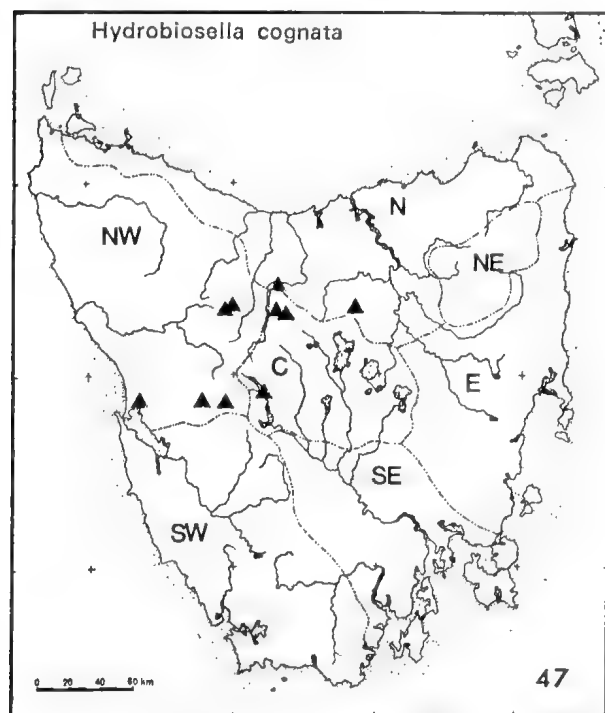


sternite 5 present in both sexes, in females the circular structure on sternite 4 present but indistinct.

♂ genitalia with segment 9 short, lateral excision present; segment 10 slightly broader at base, rounded apically. Superior appendages appear as curved, digitiform processes. Usually they are divergent or parallel, but a specimen with slightly convergent ones from Cradle Mountain has been described by Jacquemart (1965b) as *Hydrobiosella spinosa*. As no other differences were found in the holotype, which is mounted as a microscope preparation, the species is regarded as synonymous with *cognata*. Phallus with apex curved downward, a pair of small, stout spines at the tip. Inferior appendages long and slender, coxopodite about 1.75 times longer than harpago, which bear a group of small spines at the apex.

♀ abdomen typical of the genus, segments gradually tapering apically and terminating with a pair of distinct cerci.

Length of anterior wing: ♂ 7.5-8.5 mm; ♀ 8-8.5 mm.



Type material: Holotype ♂ Lake St. Clair, Feb. 1941, J. W. Evans (BMNH). Type not seen.

Holotype ♂ of *Hydrobiosella spinosa* Jacquemart, Cradle Mtn., Tas., 12 Jan. 1923, A. Tonnoir; mounted on two microscope slides (IRScNB). Type seen.

Material examined: Tasmania—9 ♂ 1 ♀ 4 km E of Liena, 17 Nov. 1972; 3 ♂ 1 ♀ Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971; 1 ♂ 1 ♀ Dove River, Cradle Mtn. Nat. Park, 14 Dec. 1974; 4 ♂ Hogarth Falls, Strahan, 10 Dec. 1974; 1 ♂ Lyell h-way 5 km NW of Collingwood River bridge, 10 Dec. 1974; 5 ♂ 5 ♀ Arrowsmith Creek 18 km SW of Derwent Bridge, 9 Dec. 1974; 1 ♂ 2 ♀ Hugel River nr. Lake St. Clair, 6 Dec. 1974; 18 ♂ 9 ♀ Snake Creek, Fisher River Road, 15 Dec. 1974; 1 ♂ 1 ♀ Fisher River, Pencil Pine Grove below Lake Mackenzie dam, 15 Dec. 1974; 1 ♂ 2 ♀ Liffey River 5 km W of Liffey, 2 Dec. 1974. All specimens collected by A. Neboiss (NMV).

Discussion: A specimen described by Jacquemart as '*Hydrobiosella cognata* sp. n.' (1965b: 32), undoubtedly should be referred to Kimmins as author, as it appears correctly in the same publication on p. 31 fig. 24. It is also noted that the wing venation in this figure is incomplete. The locality 'Otrokan' should read 'Strahan', a place where Tonnoir collected other insects on the same date (Neboiss 1974c: 15).

Distribution: Tasmania—N, NW and C provinces.

#### 48 *Hydrobiosella sagitta* sp. n

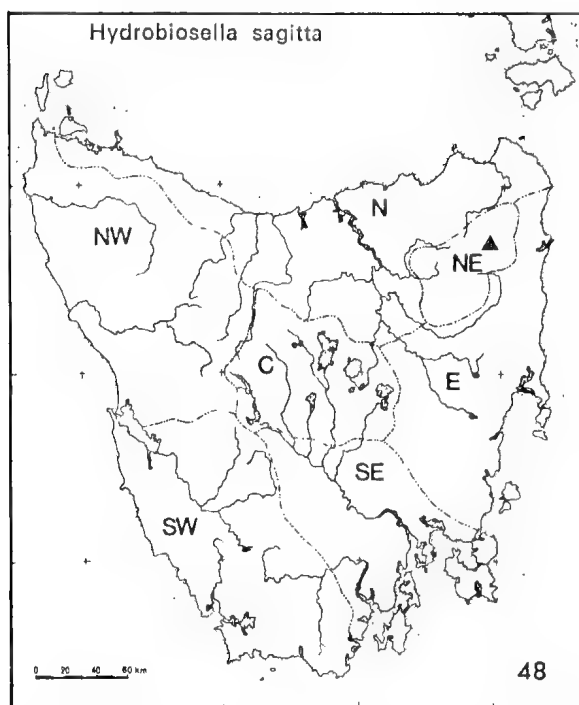
Figures 225-226

Anterior wings pale yellowish-brown, lightly and irregularly mottled. Valvular structure on sternite 5 present in both sexes, the circular structure on sternite 4 in females indistinct.

♂ genitalia with segment 9 short, lateral excision present but wider than in other Tasmanian species. Segment 10 in dorsal view broadly ovoid at the base, and distinct triangular apex; a pair of parallel dorsal ridges basally widened to small, triangular, outward turned lobes. Superior appendages extended downward and distally to a twisted, strap-like process. Phallus straight, apically expanded, clavate. Inferior appendages stout, coxopodite about twice as long as harpago which bears a group of short spines at the apex.

♀ abdomen similar in shape to that in *H. cognata*.

Length of anterior wing: ♂ 7.5-8.5 mm; ♀ 7-7.5 mm.



*Type material:* Holotype ♂ (T4489), allotype ♀ (T4490), 5 ♂ paratypes (T4491-T4495) St. Columba Falls nr. Pyengana, Tas., 21 Feb. 1971, A. Neboiss (NMV).

*Distribution:* Tasmania—NE province.

#### 49 *Hydrobiosella waddama* Mosely Figures 227-233

*Hydrobiosella waddama* Mosely in Mosely and Kimmins, 1953:393.

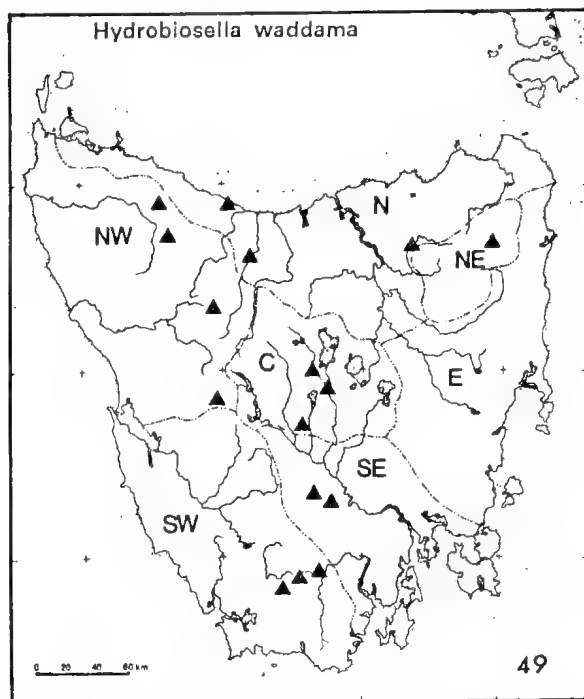
Anterior wings greyish-brown, irregularly mottled. Valvular structures on sternite 5 not present in either sex, but circular structure on sternite 4 present in females.

♂ genitalia with segment 9 membranous dorsally, anterior margin produced into a long lobe. Segment 10 long, extending almost to the apex of harpago, broad at base, from about middle tapering to narrow, rounded apex. Superior appendages entirely absent. Phallus long, slender, slightly curved, a pair of long processes arise from the base and extend to the apex of segment 10. Inferior appendages two-segmented, both coxopodite and harpago about the same length, the latter with a dense, oval-shaped mat of short, black setae on the inner surface.

♀ abdomen gradually tapers towards apex

which bears a pair of short cerci. Sternite 7 with ventral keel; segment 8 longer than segments 9 and 10 together.

*Length of anterior wing:* ♂ 6.5-8 mm; ♀ 7-9 mm.



*Type material:* Holotype ♂ Waddamana, R. Ouse, Tas., Critchley Parker (BMNH). Type not seen.

*Material examined:* Tasmania—7 ♂ 18 ♀ St. Columba Falls, Pyengana, 21 Feb. 1971; 4 ♂ 12 ♀ St. Patricks River, Targa, 22 Feb. 1971; 4 ♂ 1 ♀ Ulverstone, 4 km NW waterfalls on coastal cliffs, 18 Nov. 1972; 1 ♀ Flowerdale River, Meunna, 4 Nov. 1972; 21 ♂ 7 ♀ Hellyer River Gorge, 9 Feb. 1971; 1 ♀ Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971; 80 ♂ 10 ♀ Franklin River 20 km SW of Derwent Bridge, 11 Feb. 1971; 1 ♂ Ouse River 8 km W of Miena, 28 Feb. 1967; 1 ♂ Bradys Lake, 27 Feb. 1967; 26 ♂ 50 ♀ Lake Dobson, 20 Feb. 1967; 31 ♂ 12 ♀ Huon-Picton River junction, 18 Feb. 1967; 29 ♂ 16 ♀ Huon River nr. Blakes Opening, 9 Feb. 1966; 1 ♂ Cracroft River, 8 Feb. 1966. All specimens collected by A. Neboiss (NMV). 72 ♂ 2 ♀ Franklin River, 10 Feb. 1967, E. F. Riek (ANIC); 33 ♂ 17 ♀ Hellyer Gorge, 4 Feb. 1967, E. F. Riek (ANIC); 15 ♂ 19 ♀ Lake Dobson, 20 Feb. 1967, E. F. Riek (ANIC); 2 ♀ Ouse River 5 mls W Miena, 28 Feb. 1967, E. F. Riek (ANIC); 1 ♀ Russell Falls, 23 Feb. 1967, E. F. Riek (ANIC); 22 ♂ 3 ♀ Huon-Picton junction, 17 Feb. 1967, E. F. Riek (ANIC); 7 ♂ 4 ♀ Forth Falls, 28 Jan. 1967, E. F. Riek (ANIC).

*Distribution:* Tasmania—NE, C, N, NW, SW and SE provinces; Victoria; New South Wales.

## 5 Family STENOPSYCHIDAE Martynov (1926)

In Australia the genus *Stenopsychodes* Ulmer is the only known representative of the family Stenopsychidae. Mosely and Kimmins (1953) placed the genus in the family Polycentropodidae, but Ross (1967) analysing the family relationships, regarded it as a member of the family Stenopsychidae. He placed it alongside the family Philopotamidae as belonging to the most primitive branch of Trichoptera. Riek (1970) included all Australian species of Polycentropodidae and Stenopsychidae in the one family Psychomyidae.

In the most recent revision only two genera were included in the family Stenopsychidae (Schmid 1969). The genus *Stenopsyche* McLachlan, is mainly found in southern and eastern Asia, from India to Japan. This genus is characterized by having large ocelli and slender antennae. The entirely Australian genus *Stenopsychodes* Ulmer, is the only other genus included in the family and differs from the former by the absence of ocelli and rather robust antennae. Schmid (1969) recognized six species in this genus, to which two further species were added by Neboiss (1974a). The distribution of the genus was limited to the mountain areas along the Australian east coast, from North Queensland to Victoria, within 250 km of the coast. It is therefore most interesting to record the genus and family for the first time from Tasmania.

**Family diagnosis:** Ocelli present or absent, depending on genus. Antennae about as long, or only slightly longer than anterior wings, slender to robust, basal segment short. Maxillary palpi 5-segmented, first two segments short, somewhat thickened, segment 3 longer than the first two together, segment 4 shorter than segment 3, segment 5 long, flexible. Mesoscutum with a pair of rounded warts lateral and close to scutellum, the latter somewhat elongate triangular with a single posteriorly situated wart. Abdominal sternite 5 with lateral pore, but lateral filament absent. Wing venation complete, regular, without sexual dimorphism; in anterior wing the anal lobe well developed.

Spurs 3:4:4.

## Genus *Stenopsychodes* Ulmer

*Stenopsychodes* Ulmer, 1916:5; Mosely and Kimmins, 1953:363; Schmid, 1969:197; Neboiss, 1974a:81.

**Type species:** *Stenopsychodes mjobergi* Ulmer, 1916.

In addition to the family description, the genus is characterized by rather squarish head, which bears one small anterior and two larger posterior warts; eyes do not occupy the entire side of the head; a pair of minute elevations indicate the possible location of the lateral ocelli. The scutellum is elongate triangular, with anterior quarter produced and narrow, on either side of it rounded mesoscutal warts. Anterior wing with an oblique costal cross-vein at about the middle of the wing; forks 1-5 all present.

♂ genitalia elongate, with long, slender superior appendages; inferior appendages large, robust, single-segmented; phallus stout.

♀ abdomen tapers to a narrow, dorso-ventrally flattened, bilobed, apical segment, which bears a pair of minute cerci. Posterior angle of tergite 8 extended into divergent, rounded, ear-like flaps; sternite 9 internally with long, anteriorly produced apodeme on lateral angles.

Only one species in Tasmania.

## 50 *Stenopsychodes lineata* sp. n.

Figures 234-242

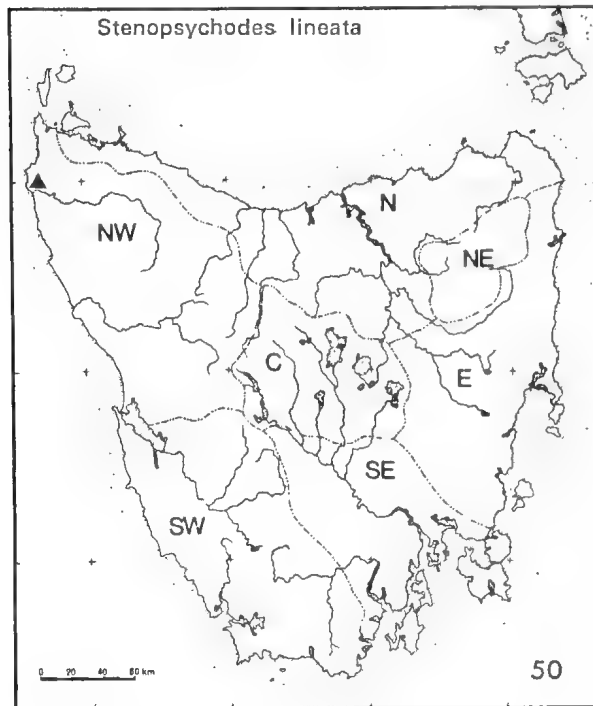
Head, thorax and abdomen, as well as the antennae, palpi and legs black; wings golden-yellow, with black hairs along the veins and with a few small, more or less distinct groups at the distal section of costal margin. Mouth parts not elongate.

♂ genitalia basically the same as in *Stenopsychodes montana* Tillyard, but differs by having a small, inwardly directed lobe on the lower margin of lateral angle of segment 9. Superior appendages long, slender, slightly curved, extending slightly beyond the apices of inferior appendages. Tergite 10 with a pair of minute, and a pair of long, slightly curved, dorsal processes; laterally a somewhat flattened, two-branched process on either side, the upper branch very long, slender, upcurved distally, the lower branch only about half the length, acute. Phallus stout, with median ventral keel. In-

ferior appendages long, robust, slightly dilated distally, rounded excision at apex, the upper margin of the excision terminating with two or three minute, acute points.

♀ genitalia sternite 8 short and broad, posterior margin with rounded central incision.

Length of anterior wing: ♂ 9-10 mm; ♀ 10-11 mm.



**Type material:** Holotype ♂ (T4801), allotype ♀ (T4802), paratype ♂ (T4803), paratype ♀ (T4804) Bluff Hill Creek, 12 km S of Marawah, Tas., 30 Nov. 1974, A. Neboiss (NMV).

**Distribution:** Tasmania—NW province.

## 6 Family ECNOMIDAE Ulmer (1903)

Since the beginning of this century the limitations and relationships between the various families within the polycentropodid-psychomyid complex have been subject for detailed research. Most of the recent authors (Ulmer, 1951; Mosely and Kimmins, 1953; Lepneva, 1964 and others) separate Polycentropodidae from Psychomyidae, although Riek (1970) considered the polycentropodids to be a subfamily of Psychomyidae. Lepneva (1956) pub-

lished a detailed analysis of this family complex and arrived at the conclusion that the larval characters strongly support differences between Polycentropodidae, Psychomyidae and Ecnomidae, raising the latter to family level. At about the same time Kimmins (1957) analysed the African Psychomyidae, comparing them with specimens from other regions in search of reliable characters for separating Ecnominae from Psychomyinae. The two genera found in Australia—*Ecnomus* and *Ecnomina*—were placed in the subfamily Ecnominae. Marlier (1958) supported Kimmins work, and independently of Lepneva, suggested that the subfamily Ecnominae should be raised to family level. Malicky (1973) followed the revised family classification proposed by Lepneva. Consequently, the family name Psychomyidae is now removed from the Australian fauna and replaced by family Ecnomidae.

**Family diagnosis:** Ocelli absent. Antennae at the most as long as the anterior wings. Maxillary palpi 5-segmented, segment 2 slightly longer than segment 1; segment 3 about as long as segment 2, terminal segment flexible. Mesoscutum with a pair of rounded warts, sometimes also with setiferous punctures. Abdominal sternite 5 without lateral filaments. In anterior wings  $R_1$  is usually forked at apex, apical fork 1 present or absent, forks 2, 3, 4 and 5 all present. In posterior wings discoidal cell present or absent, forks 2 and 5 always present, fork 3 either present or absent; fork 2 always without nygma.

Spurs 2:4:4 or 3:4:4.

### KEY TO TASMANIAN GENERA

1. Anterior wings with fork 1 present; in posterior wing fork 3 and discoidal cell absent; female abdomen terminates bluntly, segments 9 and 10 short . . . . . *Ecnomus*
- Anterior wing fork 1 absent; in posterior wing fork 3 and discoidal cell present; female abdomen gradually tapering, segments 9 and 10 long and slender . . . . . *Ecnomina*

### Genus *Ecnomus* McLachlan

*Ecnomus* McLachlan, 1864:30; Ulmer, 1907:190; Mosely and Kimmins, 1953: 378.

*Type species: Philopotamus tenellus* Rambur, 1842.

Maxillary palpi with segment 1 short, segment 2 slightly longer; segment 3 slightly longer than 2; segment 4 as long as, or slightly longer than 3; segment 5 about as long or slightly longer than all the others together. Mesoscutum and scutellum each with a pair of warts. Anterior wing with  $R_1$  forked at apex; forks 1, 2, 3, 4 and 5 present; fork 1 short; discoidal, median and thyridial cells all present. Posterior wing narrower than the anterior; forks 2 and 5 present; discoidal cell absent.

Spurs 3:4:4; the outer pair of mid-tibial spurs shorter than the inner pair. Numerous specimens of *Ecnomus continentalis* Ulmer from various localities in Queensland, all had spurs 3:4:4 and not 2:4:4, as indicated by Mosely and Kimmins (1953:378). Female with mid-tibia and tarsus dilated.

#### KEY TO TASMANIAN SPECIES OF *ECNOMUS*

1. Inferior appendage in ventral view with distal half narrow, straight (female with ventral plate of segment 8 rounded apically) . . . . . *tillyardi*
- Inferior appendage in ventral view broad, curved . . . . . 2
2. Inferior appendages broad at base, lower inner margin at the middle with long, finger-like process (female not known) . . . . . *continentalis*
- Inferior appendages broad, lower inner margin with blunt central lobe (female with ventral plates of segment 8 pointed at inner apical angle) . . . . . *russellius*

#### 51 *Ecnomus tillyardi* Mosely

Figures 243-249

*Ecnomus tillyardi* Mosely in Mosely and Kimmins, 1953:378; Jacquemart, 1965b:29.

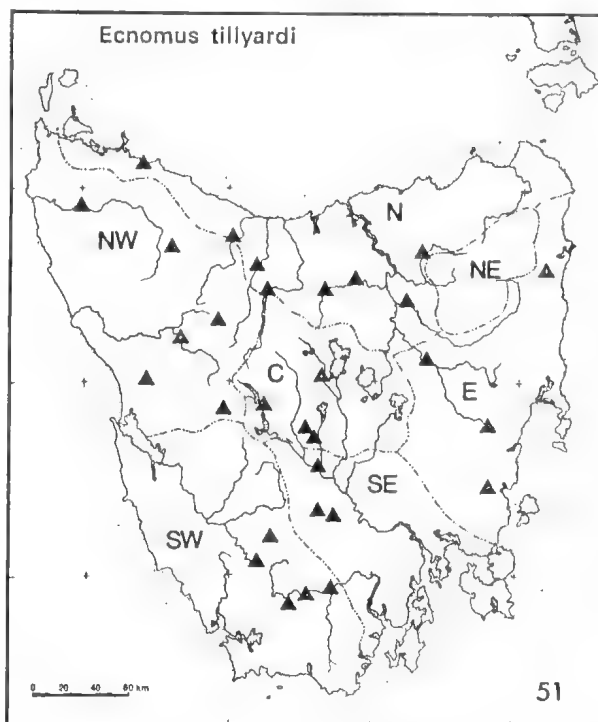
Anterior wings yellowish to greyish-brown, irrorate; underside of the body pale yellowish.

♂ genitalia with superior appendage long, slightly curved, apices on the inner surface armed with a group of strong spines; a pair of short processes at the base. Inferior appendages extending nearly to the apices of the superior appendages; proximal half broad, with an in-

wardly directed tooth at the middle; terminal half straight, narrow in ventral view, slightly flattened laterally. Phallus laterally compressed at the apex.

The female usually slightly larger and more robust than male; abdomen terminates bluntly with a pair of ventral lobes, rounded apically.

*Length of anterior wing:* ♂ 6-7 mm; ♀ 6.5-8.5 mm.



*Type material:* Type ♂ Cradle Mtn. Tas., 22 Jan. 1917, J. W. Evans (BMNH). Type not seen.

*Material examined:* Tasmania—95 ♂ 57 ♀ Leven River, Heka, 17 Nov. 1972; 15 ♂ 1 ♀ Derwent River 2 km NW Derwent Bridge, 12 Feb. 1971; 1 ♂ St. Patricks River, Targa, 22 Feb. 1971; 1 ♂ 3 ♀ National Park, 19 Feb. 1971; 1 ♂ 5 ♀ South Esk River, Evandale, 1 Mar. 1967; 4 ♂ 6 ♀ Macquarie River 8 km W Campbell Town, 9 Nov. 1972; 2 ♂ 1 ♀ Prosser River, Orford, 13 Nov. 1972; 1 ♀ Scamander River, Upper Scamander, 9 Nov. 1972; 21 ♂ 20 ♀ Mersey River, Liena, 16 Nov. 1972; 1 ♂ 1 ♀ Franklin River 20 km SW Derwent Bridge, 11 Feb. 1971; 1 ♂ Henty River 12 km NW Queenstown, 10 Feb. 1971; 2 ♂ 5 ♀ Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971; 1 ♂ Wedge River, 17 Feb. 1971; 1 ♂ Lake Pedder, 1 Feb. 1965; 4 ♂ Huon-Picton River junction, 18 Feb. 1967; 3 ♂ Huon River nr. Blakes Opening, 9 Feb. 1966; 1 ♂ Cracroft River, 8 Feb. 1966; 1 ♂ Wilsons Creek nr. Hellyer, 29 Nov.

1974; 2 ♂ 2 ♀ Meander River 3 km N of Westbury, 16 Dec. 1974; 1 ♂ 1 ♀ Meander River, Deloraine, 28 Nov. 1974; 1 ♂ 1 ♀ Tooms Lake, 4 Dec. 1974; 3 ♂ 1 ♀ Nive River 2 km W of Bronte, 5 Dec. 1974; 2 ♂ 3 ♀ Dee River 8 km NW of Ouse, 9 Dec. 1974; 2 ♂ 2 ♀ Arthur River bridge 15 km SW of Roger River, 29 Nov. 1974; 1 ♀ Bradys Lake, 9 Dec. 1974. All specimens collected by A. Neboiss (NMV).

2 ♂ 3 ♀ Huon-Picton junction, 17 Feb. 1967, E. F. Riek (ANIC); 4 ♂ 11 ♀ Hellyer Gorge, 4 Feb. 1967, E. F. Riek (ANIC); 11 ♂ 13 ♀ Murchison River, 5 Feb. 1967, E. F. Riek (ANIC); 13 ♂ 8 ♀ Derwent River, 12 Feb. 1967, E. F. Riek (ANIC); 1 ♂ Ouse River 5 mls W Miena, 28 Feb. 1967, E. F. Riek (ANIC); 1 ♂ Bronte Lagoon, 15 Feb. 1967, E. F. Riek (ANIC); 1 ♂ 6 ♀ Evandale, 1 Mar. 1967, E. F. Riek (ANIC); 6 ♂ 1 ♀ Forth Falls, 28 Jan. 1967, E. F. Riek (ANIC); 2 ♀ Lake Dobson, 20 Feb. 1967, E. F. Riek (ANIC); 1 ♀ Lake St. Clair, 13 Feb. 1967, E. F. Riek (ANIC).

*Distribution:* Tasmania—all provinces except NE; Victoria.

## 52 *Enomus russellius* sp. n.

Figures 250-254

A greyish or dull-yellowish irrorate species, somewhat larger and more robust than *E. tilliardii*, but the male genitalia close to that of *E. continentalis*.

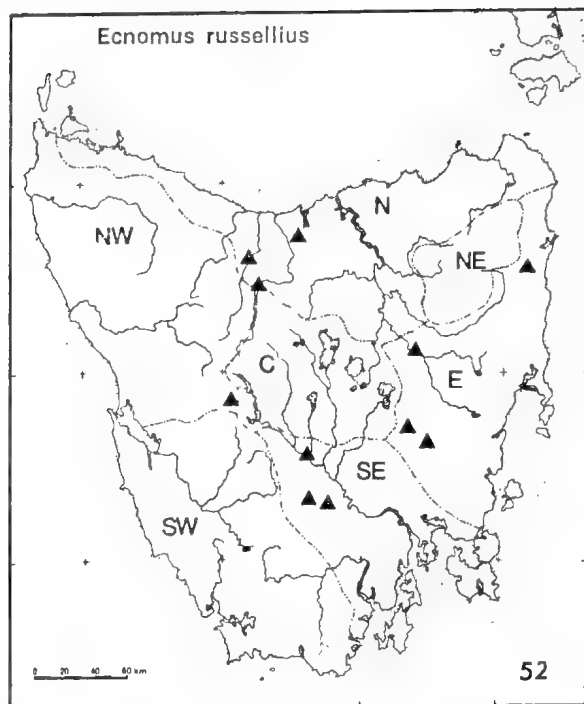
♂ genitalia with superior appendages slightly curved, apices on the inner surface with a group of spines; short, blunt processes at the base. Inferior appendages short, in ventral view broad, curved. Phallus gradually flattened laterally.

The female slightly larger than male; abdomen terminates bluntly with a pair of ventral lobes, which end with an acute point on the inner apical angle.

*Length of anterior wing:* ♂ 7.5-8.5 mm; ♀ 8-9 mm.

*Type material:* Holotype ♂ (T4854), allotype ♀ (T4855), 4 ♂ 1 ♀ paratypes (T4856-T4860) Russell Falls, National Park, Tas., 20 Feb. 1967, A. Neboiss (NMV).

*Other material examined:* Tasmania—1 ♂ Macquarie River 8 km W Campbell Town, 9 Nov. 1972; 1 ♂ Lake Dobson, 20 Feb. 1967; 1 ♀ Russell Falls, National Park, 5 Dec. 1972, P. Zwick; 1 ♂ 5 ♀ Scamander River, Upper Scamander, 9 Nov. 1972; 7 ♂ 1 ♀ Mersey River, Licna, 16 Nov. 1972; 4 ♂ Dee River 8 km NW of Ouse, 9 Dec. 1974; 1 ♂ 1 ♀ Oatlands, small creek 5 km W, 5 Dec. 1974; 1 ♂ Rubicon River 8 km SE of Sassafras, 2 Dec. 1974; 3 ♂ 4 ♀ Andover, York Rivulet, 4 Dec. 1974. All specimens collected by A. Neboiss unless stated otherwise (NMV).



9 ♂ 1 ♀ Forth Falls, 28 Jan. 1967, E. F. Riek (ANIC); 1 ♂ Navarre River, 12 Feb. 1967, E. F. Riek (ANIC).

*Distribution:* Tasmania—NW, N, E and SE provinces.

## 53 *Enomus continentalis* Ulmer

Figures 255-256

*Enomus continentalis* Ulmer, 1916:10; Mosely and Kimmins, 1953:380.

This small and very pale species is recorded so far from only one Tasmanian locality. The distinctive inferior appendages of the male genitalia separate this species from the others. The female has not yet been described.

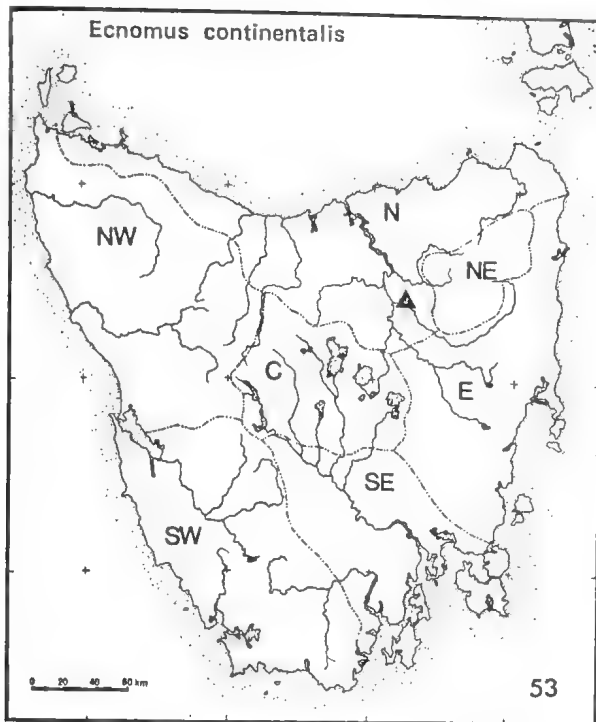
♂ genitalia with superior appendages long, slightly curved, apices on the inner surface armed with strong spines; a pair of processes at the base; inferior appendages robust, curved, the lower inner margin with finger-like process in the middle. Phallus compressed laterally at the apex.

♀ unknown.

*Length of anterior wing:* ♂ 5.5 mm.

*Type material:* Malanda, Qld. Mjöberg (NRS). Type seen.

*Material examined:* Tasmania—1 ♂ South Esk River, Evandale, 1 Mar. 1967, A. Neboiss (NMV).



**Distribution:** Tasmania—N province; Queensland; South Australia.

### Genus *Ecnomina* Kimmins

*Ecnomina* Kimmins in Mosely and Kimmins, 1953: 380.

**Type species:** *Ecnomina spinosa* Kimmins, 1953.

Maxillary palpi with segment 1 short, segment 2 one and half times as long again as the first, segments 3 and 4 each about twice as long as segment 1, segment 5 about as long as the first four together, flexible. Anterior wing with  $R_1$  forked from the cross-vein between  $Sc$  and  $R_1$ ; apical forks 2, 3, 4 and 5 present; discoidal, median and thyridial cells all present. In posterior wing  $Sc$  and  $R$  are fused near apex; apical forks 2, 3 and 5 as well as discoidal cell present. In female the abdomen gradually tapers posteriorly, segments 9 and 10 long and slender; a pair of small cerci at apex.

Spurs 3:4:4; outer tibial spurs shorter than inner, particularly those of the mid-tibia; female with mid-tibia and tarsus dilated.

Four species in Tasmania, three of which are here described as new.

### KEY TO TASMANIAN SPECIES OF *ECNOMINA*

(Males only)

1. Inferior appendages present . . . . . 2
- Inferior appendages absent . . . . . *batyle*
2. Inferior appendages fused to form a single elongate plate . . . . . *irrorata*
- Inferior appendages not fused . . . . . 3
3. Inferior appendages in lateral view as long as wide . . . . . *legula*
- Inferior appendages in lateral view longer than wide . . . . . *vega*

### 54 *Ecnomina irrorata* Kimmins

Figures 257-260

*Ecnomina irrorata* Kimmins in Mosely and Kimmins, 1953:384.

Small, brownish species with mottled anterior wings.

♂ genitalia characterized by a pair of large, dorso-lateral processes; a strongly chitinated, downcurved, distally pointed process just below phallus. Inferior appendages fused to form a single, elongate apically excised plate.

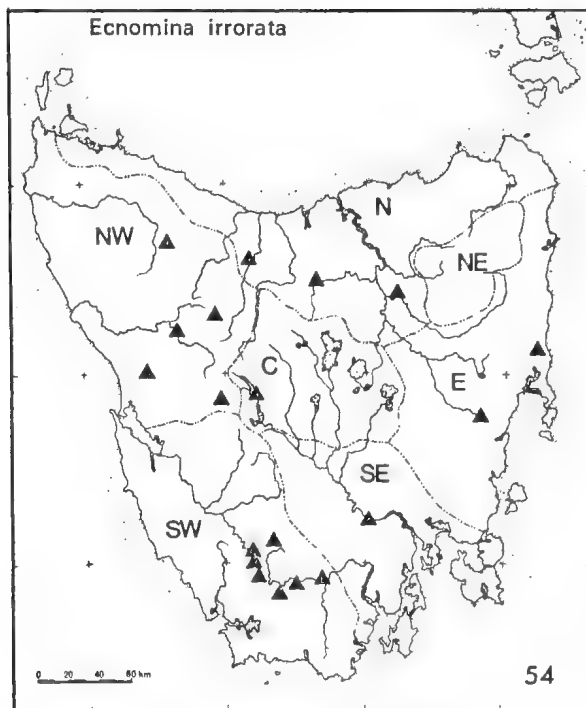
♀ abdomen with sternite 8 developed into a pair of lateral lobes, ventrally separated by a deep, wide, basally rounded excision, in the middle of which there is a long, narrow, sclerotized ridge. Segments 9 and 10 appear to be welded together to form a pair of slender, apically tapering and dorso-ventrally separated lobes; a pair of small cerci at the apex.

**Length of anterior wing:** ♂ 4.5-5 mm; ♀ 5-6 mm.

**Type material:** Type ♂ Deloraine, Tas., 26-27 Dec. 1884, McLachlan Collection (BMNH). Type not seen.

**Material examined:** Tasmania—4 ♂ 5 ♀ Huon-Picton River junction, 18 Feb. 1967; 2 ♂ 1 ♀ Huon Plains nr. Scotts Peak, 8 Feb. 1965; 2 ♀ Lake Pedder, 1 Feb. 1965; 2 ♀ Junction Creek, West Arthur Plains, 7 Feb. 1966; 10 ♀ Huon Crossing, Port Davey Track, 9 Feb. 1965; 2 ♀ Huon River, Blakes Opening, 9 Feb. 1966; 5 ♀ Cracroft River, 8 Feb. 1966; 2 ♀ Henty River 12 km NW Queenstown, 10 Feb. 1971; 19 ♂ 2 ♀ Tooms Lake, 4 Dec. 1974; 2 ♀ Derwent River 3 km W of New Norfolk, 7 Dec. 1974; 1 ♀ Apsley River, Bicheno, 9 Nov. 1972 1 ♀ Franklin River 20 km SW of Derwent Bridge, 11 Feb. 1971; 2 ♀ Derwent River 2 km NW Derwent Bridge, 12 Feb. 1971; 1 ♀ Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971. All specimens collected by A. Neboiss (NMV).





3 ♀ Lake St. Clair, 13 Feb. 1967, E. F. Riek (ANIC); 1 ♂ Forth Falls, 28 Jan. 1967, E. F. Riek (ANIC); 8 ♀ Murchison River, 5 Feb. 1967, E. F. Riek (ANIC); 1 ♂ Evandale, 1 Mar. 1967, E. F. Riek (ANIC); 2 ♀ Hellyer Gorge, 4 Feb. 1967, E. F. Riek (ANIC).

**Distribution:** Tasmania—N, NW, SW, C, SE and E provinces.

55 *Ecnomina legula* sp. n.  
Figures 261-268

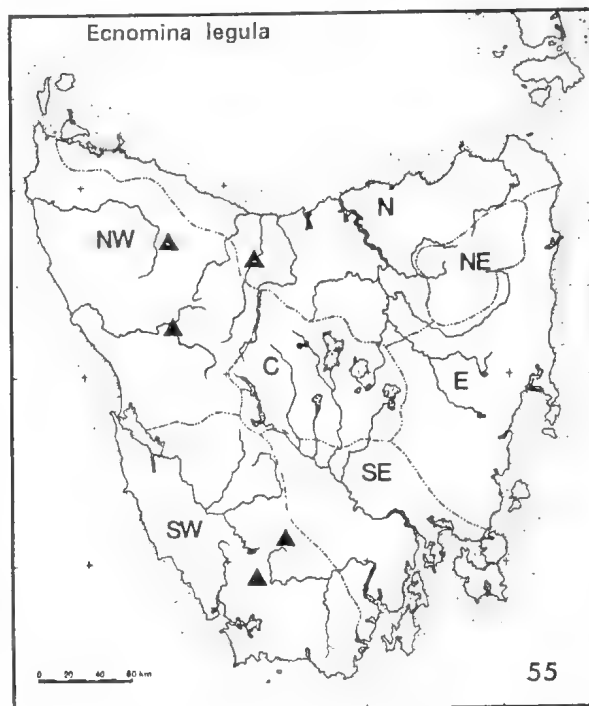
A species closely related to *Ecnomina spinosa* Kimmins from New South Wales, but differing in details of the male genitalia. Anterior wings concolorous brownish.

♂ genitalia—tergite 9 consists of a pair of curved, basally widened plates with a number of strong spines on the inner basal margin, and a heavily built lateral process just below tergite 9, covered with strong, long, downward directed bristles on its ventral margin. Phallus cylindrical, apex obliquely truncate. Inferior appendage short, laterally with down and inward curved lobe, a curved finger-like process at the upper distal angle.

♀ abdomen with segment 8 short, sternite developed into an elongate, parallel-sided, scale-like plate; segment 9 slender, tapering distally, sides thickened ventrally; segment 10

very slender, distal end slightly dilated, a pair of small cerci and a pair of small membraneous processes at the apex.

Length of anterior wing: ♂ 5.5-6 mm; ♀ 6-7 mm.



**Type material:** Holotype ♂ (T4887), allotype ♀ (T4888), 2 ♂ 5 ♀ paratypes (T4889-T4895) Huon River Crossing, Port Davey Track, Tas., 9 Feb. 1965, A. Neboiss (NMV); 2 ♂ paratypes (T4896-T4897) Huon River Crossing, Tas., 16 Feb. 1971, A. Neboiss (NMV); 1 ♂ 1 ♀ paratypes (T4898-T4899) West Arthur Plains, Tas., 3 Feb. 1965, A. Neboiss (NMV).

**Other material examined:** 2 ♂ 2 ♀ Forth Falls, 28 Jan. 1967, E. F. Riek (ANIC); 2 ♂ 4 ♀ Murchison River, 5 Feb. 1967, E. F. Riek (ANIC); 3 ♂ Hellyer Gorge, 4 Feb. 1967, E. F. Riek (ANIC).

**Distribution:** Tasmania—N, NW and SW provinces.

56 *Ecnomina vega* sp. n.  
Figures 269-271

Anterior wing concolorous greyish-brown, fork 3 sessile.

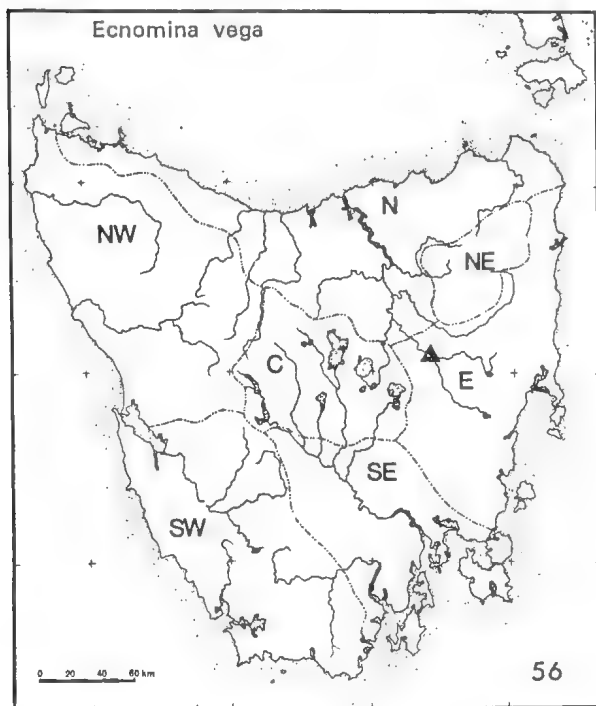
♂ genitalia of similar plan to that of *legula*, but differs in details; tergite 9 with short, in-



wardly directed mid-lateral projection on dorsal margin; gradually tapering and deeply cleft central plate below tergite 9; laterally a slender process bearing a few stout, peg-like spines at the inner apical surface, a few long, chitinous spines near the base. Phallus long, cylindrical; inferior appendages ovoid in ventral view.

♀ unknown.

Length of anterior wing: ♂ 5.5 mm.



*Type material:* Holotype ♂ (T4900) Macquarie River 8 km W Campbell Town, Tas., 9 Nov. 1972, A. Neboiss (NMV)

*Distribution:* Tasmania—E province.

## 57 *Ecnomina batyle* sp. n.

Figures 272-276

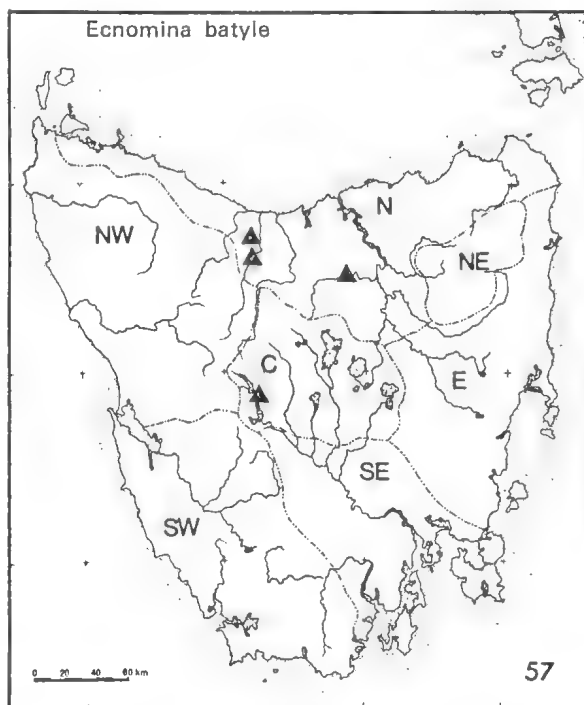
A small, fuscous species, anterior wings with dense, concolorous, brownish pubescence; the characteristic male genitalia separates this species from others in the genus.

♂ genitalia with tergite 9 short, with a pair of obliquely truncate processes arising from distal margin. Segment 10 membranous, with sclerotized median ridge. Phallus long, laterally widened at the middle, apex elevated and expanded dorsally; a long, bifurcate process be-

low the phallus. Inferior appendages apparently entirely absent.

♀ abdomen with segment 8 short, sternite developed into a long, narrow, apically slightly excised, ventral process; segment 9 very long, slender, tapering distally, segment 10 short, cylindrical, with a pair of small cerci at apex.

Length of anterior wing: ♂ 4-4.5 mm; ♀ 4-5 mm.



*Type material:* Holotype ♂ (T4861), allotype ♀ (T4862), 12 ♂ 12 ♀ paratypes (T4863-T4886) Wilmot River 10 km S of Forth, Tas., 13 Dec. 1974, A. Neboiss (NMV).

*Other material examined:* Tasmania—2 ♂ 3 ♀ Meander River 3 km N of Westbury, 16 Dec. 1974, A. Neboiss (NMV); 1 ♂ Derwent River 2 km NW of Derwent Bridge, 12 Feb. 1971, A. Neboiss (NMV); 14 ♂ 10 ♀ Forth Falls, 28 Jan. 1967, E. F. Riek (ANIC).

*Distribution:* Tasmania—N and C provinces.

## 7 Family POLYCENTROPODIDAE Ulmer (1906)

*Family diagnosis:* Ocelli absent. Antennae stout, either shorter than, or as long as anterior wings. Maxillary palpi five-segmented in both sexes; first two segments short, terminal seg-

ment long, annulated, flexible. Mesoscutum with a pair of round warts, sometimes with additional setiferous punctures. Anterior wings moderately broad, densely pubescent; discoidal and median cells always present;  $R_1$  simple; cross-vein connecting C and Sc at about the centre of costal area. Posterior wings with discoidal and median cells either present or absent. A pair of lateral filaments arise from the sternite 5.

Spurs 3:4:4.

Although Polycentropodidae was separated from Psychomyidae and raised to family level as far back as 1906, occasionally it is still referred to as a subfamily of the latter by some authors (Riek, 1970). Nevertheless, there is sufficient evidence in the adult, as well as the larval morphology, not only to regard it as a good family (Ross, 1967), but to split it even further; a group of genera, including the Australian *Stenopsychodes*, was retained into family Stenopsychidae by Schmid (1969).

The only previous record—one species of the family Polycentropodidae from Tasmania by Mosely and Kimmins (1953)—was based on misidentified specimen (for details see *Plectrocnemia altera* sp. n.). The family is now recorded from Tasmania with six new species placed in three genera, one of them described here as new. The third Australian genus, *Polyplectropus*, is not recorded from Tasmania.

#### KEY TO THE GENERA

1. In posterior wing, forks 1, 2 and 5 present . . . . . 3
- In posterior wing only forks 2 and 5 present . . . . . 2
2. In anterior wing fork 1 present, posterior wing with discoidal cell absent (genus not recorded from Tasmania) *Polyplectropus*
- In anterior wing fork 1 absent, posterior wing with discoidal cell closed . . . . . *Nyctiophylax*
3. In posterior wing, fork 2 sessile . . . . . *Plectrocnemia*
- In posterior wing, fork 2 with footstalk . . . . . *Tasmanoplegas*

#### Genus *Plectrocnemia* Stephens

*Plectrocnemia* Stephens, 1836:168; Ulmer, 1907:182; Mosely and Kimmins, 1953:353.

*Type species: Hydropsyche senex* Pictet, 1834.

Ocelli absent. Maxillary palpi long, first and second segment short, third long, fourth shorter than third, fifth very long, annulated, flexible. Antennae stout, basal segment short, bulbous. Anterior wing with forks 1, 2, 3, 4 and 5, fork 2 sessile; discoidal cell long; posterior wing with forks 1, 2 and 5 present, fork 2 sessile; discoidal cell short. Lateral filaments on sternite 5 rather long, present in both sexes. Mid-tibia and tarsi of female dilated; spurs 3:4:4.

#### KEY TO SPECIES

(Males only)

1. Anterior wing  $Cu_2$  with thickening on the curve near arculus . . . . . 2
- $Cu_2$  without thickening on the curve near arculus . . . . . 4
2. Superior appendages elongate, rounded, without a process either on the inner surface or near the base . . . . . *australica*
- Superior appendages shorter, somewhat angular, with a process on the inner surface or near the base . . . . . 3
3. Elongate, pointed, finger-like process at the base of superior appendages . . . . . *altera*
- No process at the base, but instead a truncate process arising from centre of inner surface of superior appendages . . . . . *lacuna*
4. Inferior appendages broadly curved . . . . . *caudata*
- Inferior appendages double folded . . . . . *manicata*

#### 58 *Plectrocnemia altera* sp. n.

Figures 277-286

*Plectrocnemia australica*, Kimmins non Banks, in Mosely and Kimmins, 1953:354.

The examination of a series of *Plectrocnemia* specimens from various Tasmanian localities revealed that there is more than one species represented, and it was therefore necessary to verify the identity by comparing the Tasmanian material with specimens from Victoria and New South Wales localities, including the type of *Plectrocnemia australica* Banks from

Mt Kosciusko, N.S.W. The type differed from the published illustration of the genitalia (Fig. 244) in Mosely and Kimmins (1953), which was prepared from a Tasmanian specimen, collected at Waddamana. The type of *P. australica* is figured here (Figs. 287-289) to illustrate the differences between the two species. The specimens from Cradle Mountain National Park which are here selected as type material of *P. altera* sp. n., agree with Kimmins's description (1953, p. 355) and figures.

Insect greyish-brown, venter pale, anterior wings with irregular mottling.

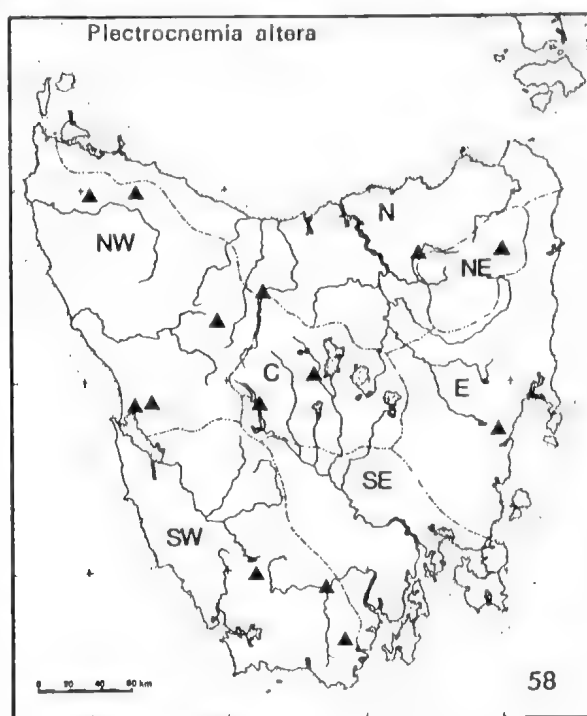
Antennae with first segment short, rounded, the subsequent ones short, smaller than the first, gradually increasing in length, pale, covered with moderately dense, dark pubescence. Mesoscutum with a pair of round warts. In anterior wings fork 1 short; fork 2 long, sessile; fork 5 very broad;  $Cu_2$  with distinct thickening on the curve near arculus in both sexes. Joining point of  $A_1$  to  $A_2$  is separated from the joining point of  $A_2$  to  $A_3$ . In posterior wings discoidal cell short, fork 1 shorter than its footstalk; fork 2 sessile; fork 5 long and broad.

♂ *genitalia*: segment 10 membranous, broad, distal margin truncate; a pair of chitinous, curved, elongate plates with rounded apices, form a deep, hood-like cover over the phallus; superior appendages in form of short, broad plates arising near the lower basal angle of the hood-like cover; the apical margin excised, but lower one curved inwardly under the phallus; an elongate, pointed, finger-like process situated at the base between superior appendages and the hood-like cover. Inferior appendages single segmented, very long, curved upwards like a pair of elephant's tusks. Phallus curved, with one dorso-ventrally flattened, apically bifurcate spine, and a pair of lateral, downward curved and pointed spines.

♀ *genitalia*: sternite 8 gradually tapering to a narrow, rounded apex; a short, elevated ventral keel at the base between lateral lobes, which are rather broad and basally rounded, tapering distally.

This species can be separated from *P. australica* by the shape of superior appendages and the longer bifurcate upper spine of the phallus.

Length of anterior wing: ♂ 8-11 mm; ♀ 9-11 mm.



*Type material*: Holotype ♂ (T4931), allotype ♀ (T4932), 6 ♂ 4 ♀ paratypes (T4933-T4942) Waldheim, Cradle Mtn. Nat. Park, Tas., 7 Feb. 1971, A. Neboiss (NMV); 1 ♂ paratype (T4943) Ouse River 8 km W of Miena, Tas., 28 Feb. 1967, A. Neboiss (NMV).

*Other material examined*: Tasmania—2 ♂ 10 ♀ Derwent River 2 km NW of Derwent Bridge, 12 Feb. 1971; 1 ♂ 5 ♀ St. Columba Falls, Pyengana, 21 Feb. 1971; 1 ♀ St. Patricks River, Targa, 22 Feb. 1971; 3 ♂ 1 ♀ Huon-Picton River junction, 18 Feb. 1967; 1 ♀ Huon Plains nr. Scotts Peak, 2 Feb. 1965; 1 ♂ Buxton River nr. Mayfield, 13 Nov. 1972; 1 ♂ Duck River 6 km SW of Roger River, 29 Nov. 1974; 1 ♂ Hogarth Falls, Strahan, 10 Dec. 1974; 3 ♂ Dip River Falls, 1 Dec. 1974; 1 ♂ Mersey River, Liena, 16 Nov. 1972. All specimens collected by A. Neboiss (NMV). 13 ♂ 14 ♀ 10 mls E Strahan, 6 Feb. 1967, E. F. Riek (ANIC); 1 ♀ Hastings Caves, 19 Feb. 1967, E. F. Riek (ANIC); 3 ♀ Huon-Picton junction, 17 Feb. 1967, E. F. Riek (ANIC).

*Distribution*: Tasmania—all provinces except SE province.

*Plectrocnemia australica* Banks.

Figures 287-289

*Plectrocnemia australica* Banks, 1939:498; Mosely and Kimmins, 1953:354.

Based on misidentification, this species was recorded by Mosely and Kimmins (1953) from two Tasmanian localities. These specimens are now referred to *P. altera*, a new species described in this publication. The name *P. australica* Banks should be omitted from the Tasmanian list of species.

Apart from being slightly smaller, *P. australica* differs mainly in a number of points in the male genitalia. The most distinct difference is the shape of the superior appendages, which are longer, more rounded and without the pointed, finger-like process at the base between the superior appendages and hood-like phallus cover. The upper spine of the phallus is shorter, and the base of inferior appendages somewhat bulbous.

Holotype ♂ Mt Kosciusko, N.S.W. 5,000 ft., 8 Dec. 1931, Harvard Aust. Exped. P. J. Darlington, MCZ Type 22090. The type specimen is now deposited in ANIC Canberra. Type seen.

#### 59 *Plectrocnemia lacuna* sp. n.

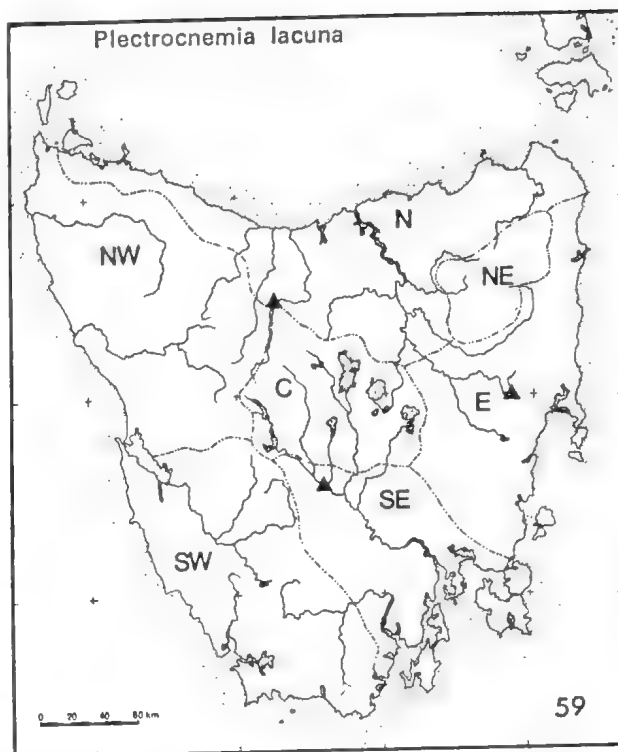
Figures 290-293

Greyish-brown species; anterior wings almost without mottling; fork 2 barely sessile, fork 4 with long footstalk; in posterior wing fork 2 barely sessile, fork 5 very broad. Lateral filament on sternite 5 in both sexes. In female the mid-tibia and tarsi dilated.

♂ genitalia in general outline very similar to both *P. australica* and *P. altera*, but differing in details. Segment 10 membranous, rather slender, truncate apically; the hood-like phallus cover somewhat more slender; superior appendage more angular in lateral view than in *australica*, but compared with *altera*, larger and without the long, pointed, finger-like process at the base, instead with a smaller truncate process arising from the centre of the inner surface. The upper spine does not reach the distal end of the phallus.

♀ genitalia very similar to that of *altera*, but apex of sternite 8 broader, ventral keel extending distally in form of a ridge almost to the apex of the sternite; lateral lobes distally rather broad.

Length of anterior wing: ♂ 8-9 mm; ♀ 9 mm.



Type material: Holotype ♂ (T4944), allotype ♀ (T4945), 8 ♂ paratypes (T4946-T4953) Lake Leake, Tas., 9 Nov. 1972, A. Neboiss (NMV).

Other material examined: Tasmania—3 ♂ 1 ♀ Dee River 8 km NW of Ouse, 9 Dec. 1974, A. Neboiss (NMV); 1 ♂ Mersey River, Liena, 16 Nov. 1972, A. Neboiss (NMV).

Distribution: Tasmania—N, E and SE provinces.

#### 60 *Plectrocnemia manicata* sp. n.

Figures 294-303

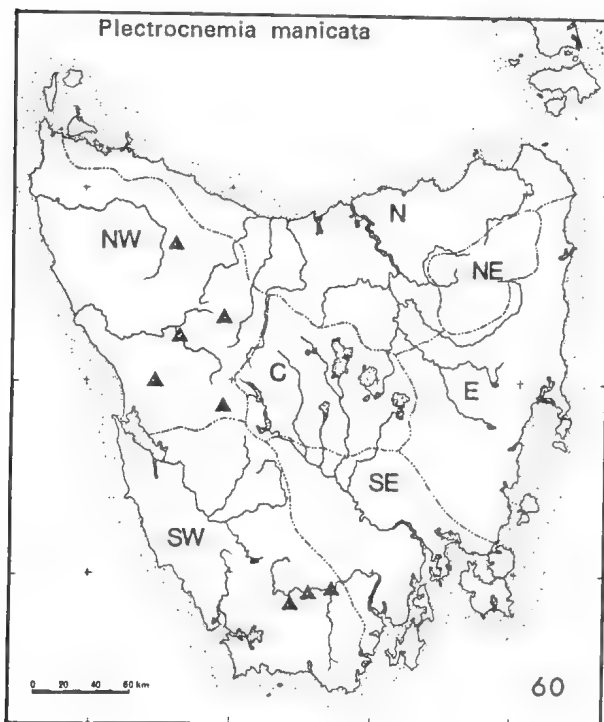
Brownish species of moderate size, venter yellowish; anterior wings densely covered with yellowish and darker greyish-brown pubescence, irregularly mottled. Anterior wing with fork 1 slightly longer than its footstalk, fork 2 sessile, fork 3 with very short footstalk, fork 4 sessile, fork 5 not excessively wide. Posterior wing with fork 1 slightly longer than its footstalk, fork 2 just reaching discoidal cell, sessile, but it is likely that it could exist also with short footstalk in some specimens; fork 5 not excessively wide. First antennal segment enlarged, rounded, the following ones smaller, elongate. Abdomen with well developed lateral filament

on sternite 5 in both sexes. Female with mid-tibia and tarsi laterally flattened, dilated.

♂ *genitalia*: segment 10 membranous, in dorsal view triangular, apically excised; at the base arise two pairs of processes, the upper pair broad at base, curved upwards and suddenly tapering to a pointed apex; the lower pair slender, at first directed downward, then at about middle sharply turned upward in a V-shaped form. Superior appendages rather squarish, with lower apical angle slightly produced; inferior appendages single segmented, moderately large, double folded, acute at distal inner angles. Phallus complex, with one upper lobe and two pairs of slender lower spines, all enveloped within a membranous cylinder.

♀ *genitalia*: abdomen terminates bluntly, but segment 10 is membranous and somewhat protruding, lateral lobes small, rounded.

*Length of anterior wing*: ♂ 8-10 mm; ♀ 8-10.5 mm.



*Type material*: Holotype ♂ (T4954), allotype ♀ (T4955), 15 ♂ 5 ♀ paratypes (T4956-T4975) Hellyer River Gorge, Tas., 9 Feb. 1971, A. Neboiss (NMV).

*Other material examined*: Tasmania—1 ♂ Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971; 1 ♂ Franklin River 20 km SW Derwent Bridge, 11 Feb. 1971; 3 ♂ Henty River 12 km NW Queenstown, 10 Feb. 1971; 4 ♂ 1 ♀ Huon River nr. Blakes Opening, 9 Feb. 1966; 3 ♂ 29 ♀ Huon-Picton River junction, 18 Feb. 1967; 9 ♂ 1 ♀ Cracroft River, 8 Feb. 1966. All specimens collected by A. Neboiss (NMV). 25 ♂ 2 ♀ Murchison River, 5 Feb. 1967, E. F. Riek (ANIC).

*Distribution*: Tasmania—NW and SW provinces.

### 61 *Plectrocnemia caudata* sp. n.

Figures 304-309

Yellowish brown species of moderate size, anterior wings with irregular mottling; fork 1 slightly longer than its footstalk, fork 2 sessile, footstalk of fork 3 short; fork 4 sessile, fork 5 excessively broad; in posterior wing fork 1 with short footstalk, fork 2 sessile, fork 5 gradually tapering, not excessively broad. Lateral process on sternite 5 present.

♂ *genitalia*: segment 10 membranous, short, in dorsal view with broad V-shaped excision apically; superior appendages in form of broad, angular plates, on the inside close to the lower margin, a number of short, peglike tubercles, each with long terminal bristle. Phallus a membranous, cylindrical structure inside of which there is a long, dorso-ventrally flattened, upper lobe, protruding beyond outer casing, apex up-curved; below that, but not protruding, a pair of shorter, downturned lobes. A pair of curved, distally pointed filaments arising from the base of segment 10. Inferior appendages in form of broad, curved plates, with lower distal angle produced posteriorly.

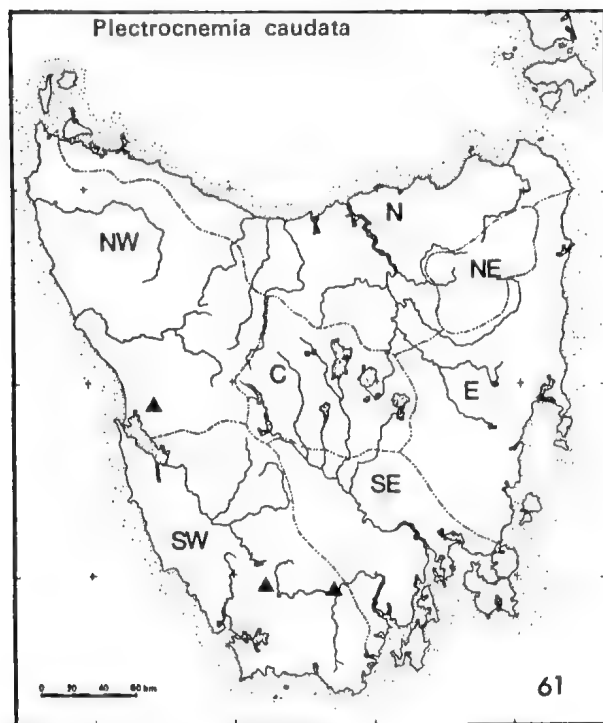
♀ unknown.

*Length of anterior wing*: ♂ 8-8.5 mm.

*Type material*: Holotype ♂ (T4976), 1 ♀ paratype (T4977) West Arthur Plains, Tas., 3 Feb. 1965, A. Neboiss (NMV); 2 ♂ paratypes (T4978-T4979) West Arthur Plains, Tas., 6 Feb. 1965, A. Neboiss (NMV).

*Other material examined*: Tasmania—1 ♂ Huon-Picton River junction, 18 Feb. 1967, A. Neboiss (NMV); 15 ♂ 10 mls E Strahan, 6 Feb. 1967, E. F. Riek (ANIC).

*Distribution*: Tasmania—NW and SW provinces.



Genus *Tasmanoplegas* gen. n.

*Type species: Tasmanoplegas spilota* gen. et sp. n.

This genus is based on a single species discovered in South West Tasmania and captured in flight during daytime among low vegetation on button grass plains in association with *Lia-pota lavara* Neb., and bears some resemblance to it. The wing colour pattern is unlike any other Australian species of this family.

Although possessing the main characteristics of the genus *Plectrocnemia*, to which it appears to be closely related, it may be separated by the stalked fork 2 in posterior wing, different arrangement of superior appendages in male genitalia and differently formed female genitalia—the lateral lobes representing sternite 8 are large, elongate triangular.

Ocelli absent; maxillary palpi with first two segments short, third longer than the first two together, fourth shorter than third, fifth long, annulated, flexible. Wing venation differing slightly in sexes. An oblique cross vein between C and Sc at basal third of the wing; discoidal cell closed in both wings, elongate in the anterior, short in posterior wing. Anterior wing

with forks 1, 2, 3, 4 and 5 present, fork 2 either with short footstalk or just touching discoidal cell; in posterior wing forks 1, 2 and 5 present, fork 2 with short footstalk. Lateral filaments on sternite 5 present in both sexes.

Spurs 3:4:4.

62 *Tasmanoplegas spilota* sp. n.

Figures 310-314

Head and thorax black, covered with golden hairs; antennae stout, about as long as anterior wings, yellowish-brown at base, gradually changing to dark brown distally, first segment somewhat rounded, slightly bigger than the following one.

Anterior wings densely covered with blackish-brown pubescence, interrupted by distinct white pattern—three distal spots, transverse band at distal third of the wing, broken in the middle, costal spot about midway, complete transverse band at basal third, small round spot and an angular one near the base. Wing venation as given in generic diagnosis. Position of cross-vein closing median cell in the anterior wing as well as the length of fork 3 differs in the specimens examined, therefore in the male fork 3 and 4 both sessile, in the female both stalked. Posterior wings unicolorous, discoidal cell short, forks 1, 2 and 5 present, fork 2 with footstalk.

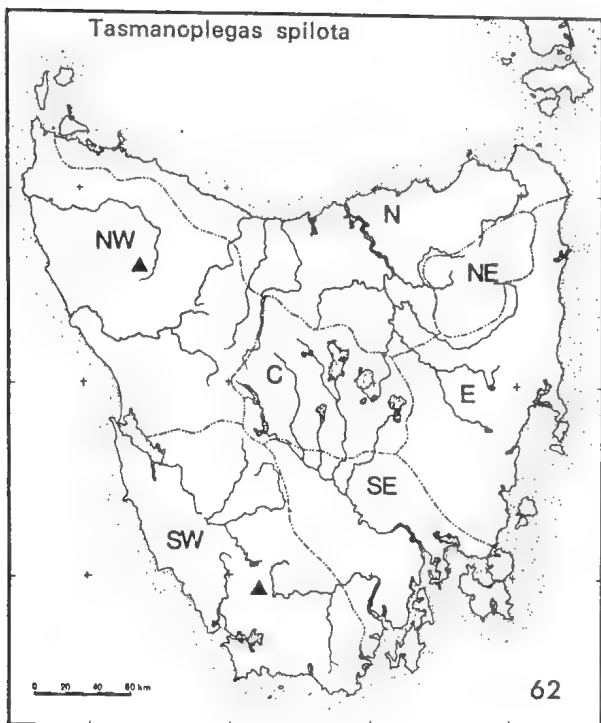
♂ *genitalia*: segment 10 membranous, short and broad, superior appendages with long, downward curved, sickle shaped, upper branch, and short, bilobed, lower branch; phallus cylindrical, distally slightly broadened, at the base with a pair of triangular lobes. Inferior appendages as large, curved plates.

♀ *genitalia*: lateral lobes of sternite 8 in form of two large, elongate, triangular plates, median lobe broad, distally rounded.

*Length of anterior wing*: ♂ ♀ 5.5-6 mm.

*Type material*: Holotype ♂ (T4980), allotype ♀ (T4981), 1 ♀ paratype (T4982) West Arthur Plains, Tas., 6 Feb. 1965, A. Neboiss (NMV); 1 ♂ paratype, 5 mls SW Waratah, 2000 ft., Tas. 17 Feb. 1963, I. F. B. Common and M. S. Upton (ANIC).

*Distribution*: Tasmania—SW and NW provinces.



### Genus *Nyctiophylax* Brauer

*Nyctiophylax* Brauer, 1865:419; Ulmer, 1907:186; Mosely and Kimmins, 1953:357.

*Type species: Nyctiophylax sinensis* Brauer, 1865.

Ocelli absent. Maxillary palpi with first two segments short, third about as long or longer than the first and second together, fourth slightly shorter than third, fifth shorter than the first four together. Antennae stout, about as long as anterior wings. Mesoscutum with a pair of round warts. Anterior wings with apical forks 2, 3, 4 and 5 present; fork 2 sessile; junction of  $A_1$  with  $A_2$ , and  $A_2$  with  $A_3$  very close together. Posterior wing with forks 2 and 5 only; fork 2 sessile; discoidal cell closed in both wings. Lateral filaments on sternite 5 present in both sexes. Mid-tibia and tarsi of female dilated.

Spurs 3:4:4.

Only two specimens of this genus were previously known from Australia, one male from the Northern Territory, representing *N. parvus* Mosely, 1953, and an undescribed female from Queensland. The genus is now represented in Tasmania by one new, endemic species.

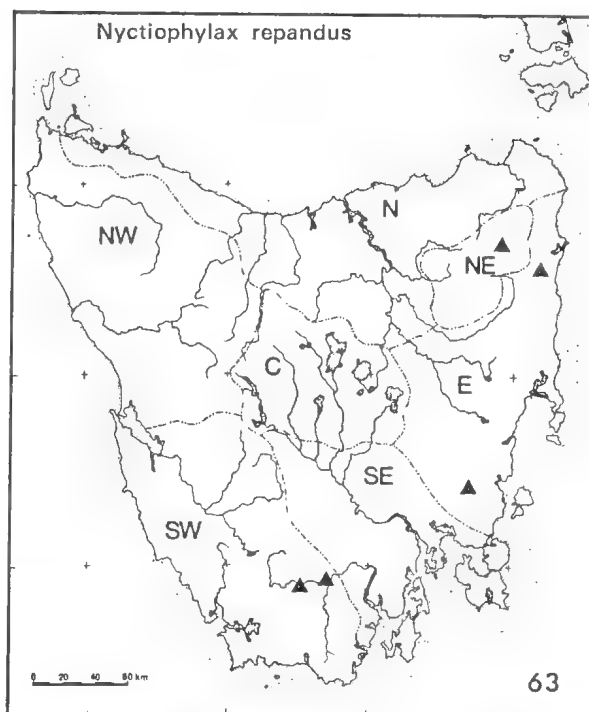
### 63 *Nyctiophylax repandus* sp. n.

Figures 315-321

Anterior wings greyish-brown, abdomen yellowish-brown, ventral surface paler. Antennae with first segment short, bulbous, the following ones more or less elongate, with encircling median ring of short, dark hairs. Lateral filament on sternite 5 slender, present in both sexes. In female mid-tibia and tarsi compressed, dilated.

♂ *genitalia*: sternite 9 somewhat triangular in lateral view; segment 10 membranous, broad, rounded distally; superior appendages in form of slightly curved plates; phallus membranous, broad at base, cylindrical and flexible distally, encased by an upper and lower pair of processes, the upper pair pointed apically, lower ones excised ventrally at apical half, rounded at apex. Inferior appendages curved S-shaped, bluntly pointed at apex.

♀ *genitalia*: with lateral plates rather angular, widely separated by the broad sternite 8 which at the middle has a transverse edge; small, pointed lateral protuberances on segment 9.



Length of anterior wing: ♂ 6.5-7.5 mm; ♀ 8 mm.



**Type material:** Holotype ♂ (T4983), allotype ♀ (T4984), 6 ♂ 1 ♀ paratypes (T4985-T4991) Scamander River, Upper Scamander, Tas., 9 Nov. 1972, A. Neboiss (NMV); 5 ♂ paratypes (T4992-T4996) St. Columba Falls, Pyengana, Tas., 21 Feb. 1971, A. Neboiss (NMV).

**Other material examined:** Tasmania—5 ♂ Prosser River 2 km W of Buckland, 7 Dec. 1974; 3 ♂ Huon River nr. Blakes Opening, 9 Feb. 1966; 16 ♂ Huon-Picton River junction, 18 Feb. 1967 (specimens from the last two localities are slightly smaller—5.5-6.5 mm). All specimens collected by A. Neboiss (NMV). 5 ♂ Huon-Picton junction, 17 Feb. 1967, E. F. Riek (ANIC).

**Distribution:** Tasmania—E, NE and SW provinces.

#### 8 Family HYDROPSYCHIDAE Curtis (1835)

**Family diagnosis:** Ocelli absent; antennae either shorter or considerably longer than the anterior wings, scape short, distinctly thickened. Maxillary palpi five-segmented, distal segment long, flexible, usually about as long or longer than the four proximal segments together. Mesoscutum without warts, scutellum with one large central one. Wing venation variable according to the subfamily, in anterior wing fork 1 always present and with footstalk. Male genitalia without superior appendages. Spurs variable (0-2): (2-4): (2-4).

According to Flint (1974) the family is divided into four sub-families, the Arctopsychinae, Diplectroninae, Hydropsychinae and Macronematinae. Of these only two—Diplectroninae and Hydropsychinae are known to occur in Tasmania. This subdivision is based mainly on larval characters, but in adults certain characters overlap this division. The internal membraneous organs within segments 6 and 7 are present in *Diplectrona* and *Smicrophylax*, lateral filaments absent in *Cheumatopsyche*, but present in the other three Tasmanian genera. Following the subdivision as proposed by Flint (1974) the Tasmanian genera are placed in two subfamilies.

#### Subfamily

#### Hydropsychinae

#### Tribe

#### Smicrideini

Genus *Smicrophylax*  
Genus *Asmicridea*

#### Tribe

#### Hydropsychini

#### Subfamily

#### Diplectroninae

Genus *Cheumatopsyche*

Genus *Diplectrona*

#### KEY FOR SEPARATING TASMANIAN GENERA

1. Abdominal sternite 5 with lateral process present . . . . . 2
- Abdominal sternite 5 without lateral process . . . . . *Cheumatopsyche*
2. Male abdominal segments 6 and 7 with internal membraneous organs present . . . . . 3
- Male abdominal segments 6 and 7 without internal membraneous organs . . . . . *Asmicridea*
3. Fork 2 sessile in anterior and posterior wings . . . . . *Diplectrona*
- Fork 2 with footstalk in anterior and posterior wings . . . . . *Smicrophylax*

#### Genus *Cheumatopsyche* Wallengren

*Cheumatopsyche* Wallengren, 1891:142; Ulmer, 1907:169; Mosely and Kimmins, 1953:323.

**Type species:** *Hydropsyche lepida* Pictet, 1834.

Antennae slightly exceeds the length of anterior wing; segment 2 short, rounded; segment 3 and the subsequent ones slender with dark, oblique line on each. Head with anteromesal and two pairs of antero-lateral warts, and one pair of well-developed posterolateral warts.

Anterior wing with forks 1, 2, 3, 4 and 5 present, discoidal cell very short, median cell longer than discoidal cell; a narrow hyaline line along M just above the median cell. Cross-vein closing thyridial cell and cross-vein Cu<sub>1</sub>-Cu<sub>2</sub> close to each other.

Spurs 2:4:4.

Only one species in Tasmania.

#### 64 *Cheumatopsyche modica* (McLachlan)

Figures 322-327

*Hydropsyche modica* McLachlan, 1871:133; Ulmer, 1907:171.

*Hydropsychodes modica*, Ulmer, 1916:11.

*Cheumatopsyche modica*, Mosely and Kimmins, 1953:323.

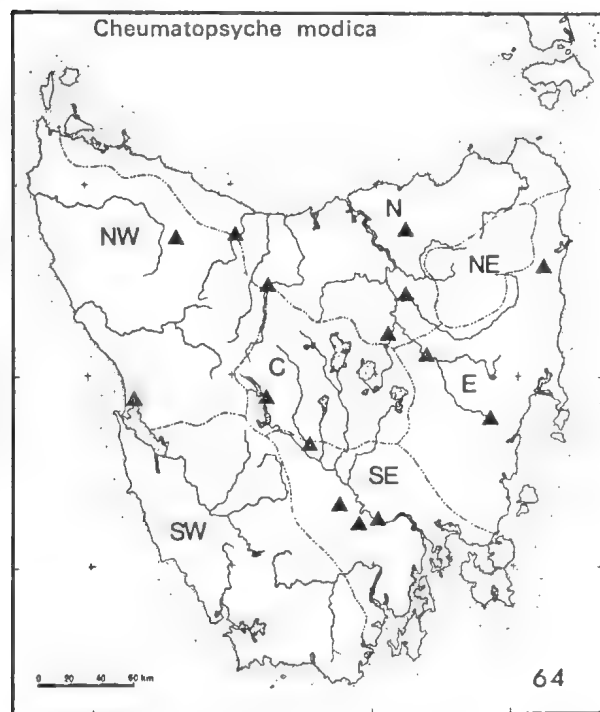
Anterior wings more or less distinctly mottled, in posterior wing fork 1 and median cell absent.



♂ *genitalia*: posterior margin of tergite 9 developed into a pair of flat, rounded lobes; segment 10 broad, quadrate, with broad angular central excision, apical angles rounded and produced posteriorly; small rounded wart on either side close to the base of apical angles. Phallus slender, apex with deep median cleft. Inferior appendages slender, two-segmented; coxopodite thickened distally, harpago short, claw-shaped.

♀ abdomen terminates bluntly; posterior margin of tergite 8 with broad, shallow V-shaped median excision; posterior margin of sternal plate slightly concave.

*Length of anterior wing*: ♂ 7.5-8.5 mm; ♀ 8-10 mm.



*Type material*: Type ♂ Australia, Victoria (Edwards), McLachlan collection (BMNH). Type not seen.

*Material examined*: Tasmania—26 ♂ 64 ♀ Derwent River 2 km NW Derwent Bridge, 12 Feb. 1971; 4 ♂ 14 ♀ Hellyer River Gorge, 9 Feb. 1971; 11 ♂ 2 ♀ Black Bobs Creek 15 km NW of Ouse, 9 Dec. 1974; 1 ♀ Hogarth Falls, Strahan, 10 Dec. 1974; 1 ♂ Derwent River 3 km W of New Norfolk, 7 Dec. 1974; 2 ♂ Tooms Lake, 4 Dec. 1974; 8 ♂ 8 ♀ Plenty River 6 km E of Moogara, 7 Dec. 1974; 29 ♂ 14 ♀ Macquarie River 8 km W Campbell Town, 9 Nov. 1972; 5 ♂

2 ♀ Lake River 5 km SW Delmont, 9 Nov. 1972; 45 ♂ 69 ♀ Mersey River, Liena, 16 Nov. 1972; 7 ♀ South Esk, Evandale, 1 Mar. 1967; 1 ♂ Styx River, Westerway, 23 Nov. 1972; 12 ♂ 85 ♀ Scamander River, Upper Scamander, 9 Nov. 1972; 3 ♂ 63 ♀ Leven River, Heka, 17 Nov. 1972; 1 ♂ Lilydale, creek 2 km N, 16 Dec. 1974. All specimens collected by A. Neboiss (NMV).

*Distribution*: Tasmania—NW, N, C, SE, and E provinces; Victoria; New South Wales; Queensland.

### Genus *Smicrophylax* gen. n.

*Type species*: *Smicrophylax creektona* gen. et sp. n.

In the study of *Smicridea* species from North and Central America, Flint (1974) reduced *Rhyacophylax* Müller to the status of a sub-genus of *Smicridea* McLachlan on the basis that he was unable to separate the larvae and pupae of the two groups. Nevertheless, in the adult stage the two taxa are very distinct. Comparing these two American groups with the Australian species included in the genus *Smicridea* by authors, it became quite evident that there are considerable morphological differences which warrant the segregation of the Australian group at the generic level. The differences of the three taxa are shown in the following table.

Ocelli absent, maxillary palpi five-segmented, terminal segment long, annulated, flexible, longer than the basal four segments together. Antennae shorter than the anterior wings, segment 3 and the subsequent ones with dark, more or less distinct, oblique line. Head dorsally with anterolateral warts present, broad, sometimes divided longitudinally, often indistinct; anteromesal wart absent, posterolateral warts large, well developed; dorsal sutures distinct. Posterior wings broad, rounded. Abdominal sternite 5 with slender lateral filament in both sexes. The male abdominal segments 6 and 7 each with a pair of internal membranous organs. Tibiae and tarsi of the intermediate legs dilated and flattened in female. Male genitalia resembling closely that of the genus *Potamyia* from North America.

Spurs 2:4:4. One of the anterior spurs is very small, and no doubt, has been overlooked by many authors in the past.

| Structure                       | Genus | <i>Smicridea</i><br>(sensu stricto)  | <i>Rhyacophylax</i>  | <i>Smicrophylax</i>  |
|---------------------------------|-------|--|--|--|
| Anteromesal wart of head        |       | Well developed   | Well developed   | Absent   |
| Head—dorsal sutures             |       | Absent   | Absent   | Well developed   |
| Posterior wing                  |       | Not distinctly widened<br>$R_{2+3}$ and $R_{4+5}$ parallel for a considerable distance<br>R-M system well separated from $Cu_1$<br>M joins R some distance from Rs | Not distinctly widened<br>$R_{4+5}$ separates from $R_{2+3}$ at a sharp angle<br>R-M system approximate to $Cu_1$<br>M joins R some distance from Rs | Distinctly widened, rounded<br>$R_{2+3}$ and $R_{4+5}$ parallel for some distance<br>R-M system parallel but not very close to $Cu_1$<br>M joins R close to Rs |
| Lateral filaments on sternite 5 |       | Absent   | Present  | Present  |
| Spurs                           |       | 1:4:4  | 1:4:2 (♂)  | 2:4:4  |

All the Australian species previously grouped in genus *Smicridea* should now be included in this new genus. Only two of the species are known to occur in Tasmania.

KEY TO TASMANIAN SPECIES  
(Males only)

1. Anterior wing white with blackish costal margin . . . . . *creektona*
- Anterior wing with more or less pronounced blackish pattern on the entire wing . . . . . *simplex*

65 *Smicrophylax creektona* sp. n.

Figures 328-338

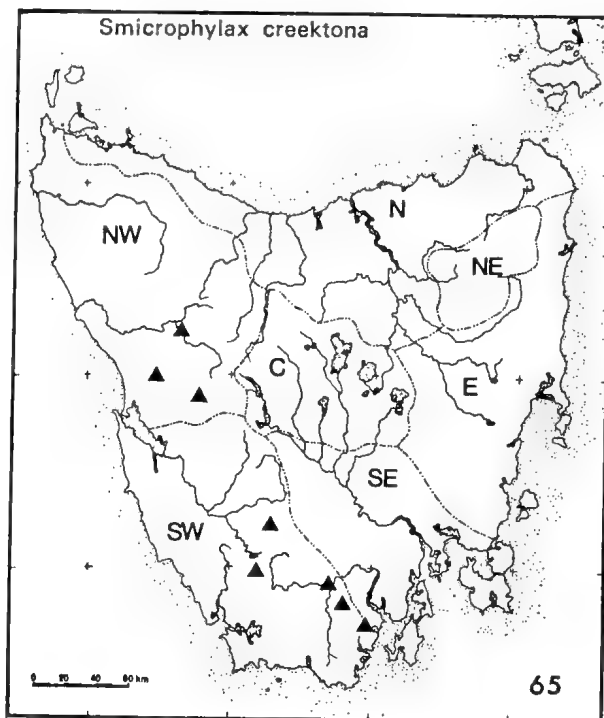
Head and thorax blackish, covered with long, white pubescence, eyes large, reddish-brown; anterior wings delicate, white, densely covered with white pubescence, only costal margin blackish; posterior wings white throughout. It is separated from a similar Victorian species *S. parvula* Mosely, by the absence of an internal, chitinous, median spine near the apex of phallus.

♂ genitalia with tergite 9 strongly produced posteriorly, deeply cleft, apices upturned; phallus slender, dilated apically; inferior appendages long, two-segmented, harpago small.

♀ differs from the male by its dull, uniformly or slightly mottled, greyish brown an-

terior wings; the shape of sternite 8 separates this species from *Smicrophylax simplex*.

Length of anterior wing: ♂ 6-7 mm; ♀ 6.5-7.5 mm.



Type material: Holotype ♂ (T5114) Creekton River nr. Dover, Tas., 14 Nov. 1972, A. Neboiss (NMV); allotype ♀ (T5115) Huon-

Picton River junction, Tas., 15 Nov. 1972, A. Neboiss (NMV); 15 ♂ paratypes (T5116-T5130) Creekton River nr. Dover, Tas., 14 Nov. 1972, A. Neboiss (NMV); 2 ♂ 1 ♀ paratypes (T5131-T5133) Huon-Picton River junction, Tas., 15 Nov. 1972, A. Neboiss (NMV).

*Other material examined:* Tasmania—2 ♂ 1 ♀ Huon Plains nr. Scotts Peak, 2 Feb. 1965, A. Neboiss (NMV); 2 ♀ Wedge River 5 Dec. 1972, P. Zwick (NMV); 1 ♂ Arve River 10 km W of Geeveston, 15 Nov. 1972, A. Neboiss (NMV); 2 ♂ 1 ♀ Henty River 12 km NW of Queenstown, 10 Feb. 1971, A. Neboiss (NMV); 1 ♂ Murchison River 4 km S of Tullah, 12 Dec. 1974, A. Neboiss (NMV); 1 ♂ 10 ♀ Collingwood River bridge, Lyell h-way, 9 Dec. 1974, A. Neboiss (NMV). 53 ♂ 5 ♀ Murchison River, 5 Feb. 1967, E. F. Riek (ANIC).

*Distribution:* Tasmania—SE, SW and NW provinces.

66 *Smicrophylax simplex* (Jacquemart)  
comb. nov.

Figures 339-345

*Diplectrona simplex* Jacquemart, 1965b:29.

The examination of the holotype male, which is mounted as a microscope preparation on three glass slides, showed that it belongs to the *Smicrophylax* group of species. It is separated from the other Tasmanian species by the blackish, patterned, anterior wings and the shape of the inferior appendages in the male, and by the broader shape of sternite 8 in the female.

*Length of anterior wing:* ♂ 4.5-6 mm; ♀ 6-8 mm.

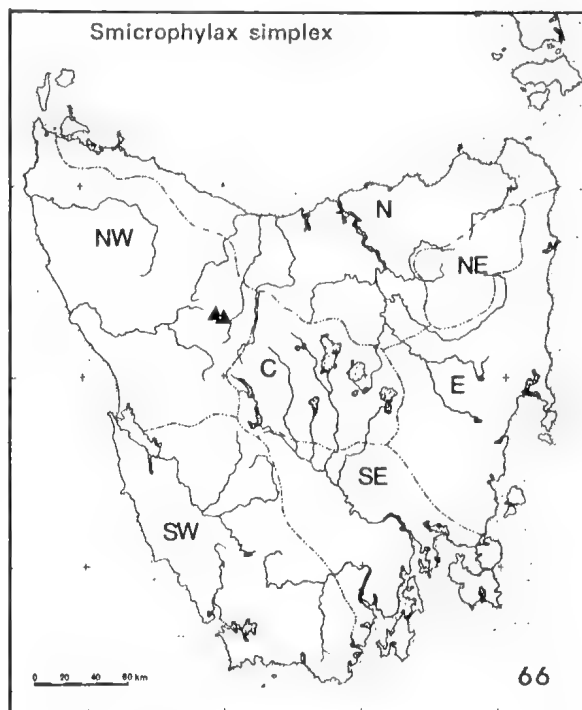
*Type material:* Holotype ♂ Cradle Mtn., Tasmania, 27 Jan. 1923, A. Tonnoir (IRScNB). Type seen.

*Material examined:* Tasmania—7 ♂ 68 ♀ Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971, A. Neboiss (NMV); 3 ♂ 10 ♀ Dove Lake, Cradle Mtn. Nat. Park, 9 Dec. 1972, P. Zwick (NMV); 1 ♂ Lake Lilla, Cradle Mtn. Nat. Park, 14 Dec. 1974, A. Neboiss (NMV); 40 ♂ 29 ♀ Dove River, Cradle Mtn. Nat. Park, 14 Dec. 1974, A. Neboiss (NMV).

*Distribution:* Tasmania—NW province.

Genus *Asmicridea* Mosely

*Asmicridea* Mosely in Mosely and Kimmins, 1953: 333.



*Type species:* *Smicridea grisea* Mosely, 1933.

Head with anterolateral warts present, narrow elongate, not divided longitudinally, anteromesal wart absent, posterolateral warts large, well developed; dorsal sutures distinct. Antennae shorter than anterior wings; segment 3 and the subsequent ones each with a more or less distinct oblique line. On posterior wing fork 1 absent. Lateral filament on abdominal sternite 5 long and slender, present in both sexes. Tibiae and tarsi of the intermediate legs dilated and laterally flattened in female. Fringe of long, whitish hair on posterior legs in both sexes, although more pronounced in male. Male abdominal segments 6 and 7 without internal membranous organs.

Spurs 2:4:4.

The species of this and the preceding genus are some of the best known caddis flies in Australia. The striking whiteness of the male wings could be seen during warm, calm evenings, when they appear in large numbers above the water. They are known under the popular name of "snow flake caddis" and are particularly familiar to fishermen.

KEY TO THE SPECIES OF THE GENUS  
*ASMICRIDEA*

1. Male posterior wing twice as long as broad . . . . . *grisea*
- Male posterior wing one and a half times as long as broad . . . . . *edwardsi*

67 *Asmicridea edwardsi* (McLachlan)

Figures 346-353

*Hydropsyche edwardsi* McLachlan, 1866:269; Ulmer, 1907:171.

*Smicridea nivea* Ulmer, 1905b:104.

*Scimridea edwardsi*, Ulmer, 1916:13; Mosely, 1933: 218.

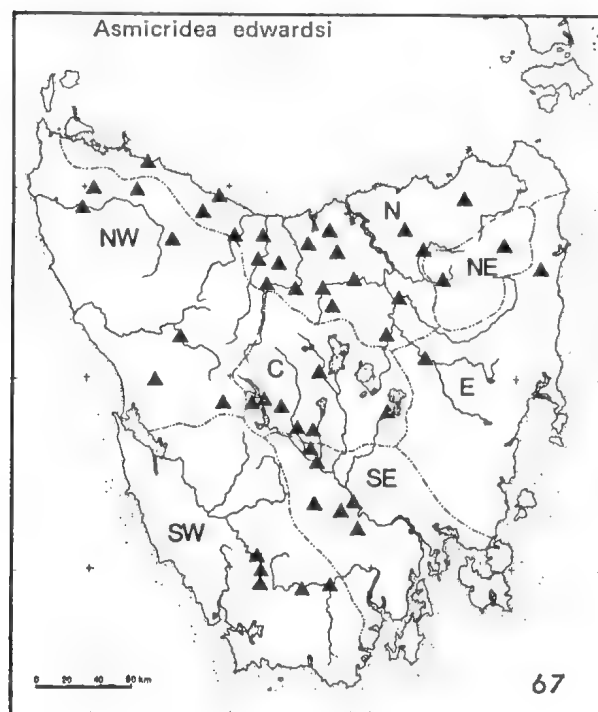
*Asmicridea edwardsi*, Mosely and Kimmins, 1953: 333.

The anterior wings in the male are white with more or less extensive black pattern, which varies from locality to locality. The females are larger with more or less unicolorous greyish-brown wings.

♂ genitalia of the same basic pattern as that of *Smicrophylax*, but differing in details of the phallus.

♀ abdomen with sternite 8 broad, upper section of posterior margin concave.

Length of anterior wing: ♂ 8-10 mm; ♀ 9-11.5 mm.



Type material: ♂ Melbourne, Australia (Edwards), McLachlan collection (BMNH). Type not seen.

Material examined: Tasmania—37 ♂ 54 ♀ Hellyer River Gorge, 9 Feb. 1971; 14 ♂ 14 ♀ same loc., 12 Dec. 1974; 1 ♀ Mackintosh River, 3 Dec. 1972, P. Zwick; 1 ♂ Henty River 12 km NW of Queenstown, 10 Feb. 1971; 2 ♂ Henty River, 3 Dec. 1972, P. Zwick; 1 ♂ 1 ♀ Guide River Falls near Ridgley, 18 Nov. 1972; 2 ♂ Burnie, 18 Nov. 1972; 29 ♂ Wilson Creek nr. Hellyer (Pebbly Bay), 29 Nov. 1974; 13 ♂ 58 ♀ Dip River Falls, 1 Dec. 1974; 1 ♂ Duck River 6 km S of Roger River, 29 Nov. 1974; 2 ♂ Arthur River bridge 15 km SW of Roger River, 29 Nov. 1974; 10 ♂ 2 ♀ Macquarie River 8 km W Campbell Town, 9 Nov. 1972; 1 ♂ Lake River 5 km SW Delmont, 9 Nov. 1972; 4 ♂ 1 ♀ Saxon Creek 10 km NW Frankford, 19 Nov. 1972; 1 ♂ Franklin River, Frankford, 19 Nov. 1972; 34 ♂ 27 ♀ Leven River, Heka, 17 Nov. 1972; 4 ♂ Minnow River, Paradise, 17 Nov. 1972; 3 ♂ 18 ♀ Mersey River, Liena, 16 Nov. 1972; 2 ♂ Sassafras Creek 4 km W Mole Creek, 8 Dec. 1972, P. Zwick; 3 ♂ 2 ♀ Meander River, Deloraine, 28 Nov. 1974; 1 ♀ Meander River 3 km N Westbury, 16 Dec. 1974; 1 ♀ Rubicon River 8 km SE of Sassafras, 2 Dec. 1974; 1 ♂ 2 ♀ Quamby Brook 1 km E of Golden Valley, 16 Dec. 1974; 8 ♂ 11 ♀ St. Patricks River, Targa, 22 Feb. 1971; 7 ♂ 10 ♀ Grt. Forester River 5 km NW Forester, 11 Nov. 1972; 1 ♂ 50 ♀ South Esk River, Evandale, 1 Mar. 1967; 7 ♂ 4 ♀ North Esk River Blessington, 1 Mar. 1967; 2 ♂ 9 ♀ Lilydale, creek 2 km N, 16 Dec. 1974; 34 ♂ 69 ♀ St. Columba Falls, Pyengana, 21 Feb. 1971; 18 ♂ 33 ♀ Scamander River, Upper Scamander, 9 Nov. 1972; 1 ♀ Tyenna River, National Park, 6 Jan. 1971, E. Hamilton-Smith; 2 ♂ same loc. 15 Nov. 1972; 2 ♂ same loc., 6 Dec. 1972, P. Zwick; 3 ♀ Ouse River 8 km W Miena, 28 Feb. 1967; 6 ♂ 5 km W of Bronte, small creek, 8 Nov. 1972; 8 ♂ 43 ♀ Franklin River 20 km SW Derwent Bridge, 11 Feb. 1971; 20 ♂ 17 ♀ Derwent River 2 km NW Derwent Bridge, 12 Feb. 1971; 15 ♂ Clarence River 9 km E Derwent Bridge, 4 Dec. 1972, P. Zwick; 7 ♂ 1 ♀ Clyde River nr. Interlaken, 24 Nov. 1971; 4 ♂ Lake Dobson, 20 Feb. 1967; 2 ♂ 1 ♀ Styx River, Westerway, 23 Nov. 1972, J. Blyth; 1 ♀ Black Bobs Creek 15 km W of Ouse, 9 Dec. 1974; 19 ♂ 19 ♀ Bradys Lake, 27 Feb. 1967; 8 ♂ 2 ♀ same loc., 9 Dec. 1974; 14 ♂ 2 ♀ Dee River 8 km NW of Ouse, 9 Dec. 1974; 1 ♂ Lake St. Clair, Derwent Basin, 6 Dec. 1974; 1 ♂ Plenty River 6 km E of Moogara, 7 Dec. 1974; 4 ♂ 29 ♀ Lake Pedder, 31 Jan. 1965; 10 ♂ 2 ♀ Huon-Picton River junction, 18 Feb. 1967; 1 ♂ same loc., 15 Nov. 1972; 3 ♂ 8 ♀ Huon Plains nr. Scotts Peak, 2 Feb. 1965; 1 ♂ West Arthur Plains, 7 Feb. 1965; 1 ♂ Junction Creek, West Arthur Plains, 5 Jan. 1975; P. Morison; 2 ♀ Huon River, Blakes Opening, 9 Feb. 1966. All specimens collected by A. Neboiss except where stated otherwise (NMV). 40 ♂ 9 ♀ Franklin River, 10 Feb. 1967, E. F. Riek (ANIC); 2 ♂ Lake St. Clair, 13 Feb. 1967, E. F. Riek (ANIC); 3 ♂ 1 ♀ Bronte Lagoon, 15 Feb. 1967, E. F. Riek (ANIC); 11 ♂ 3 ♀ Forth Falls, 28 Jan. 1967, E. F. Riek (ANIC); 24 ♂ 10 ♀ Murchison River, 5 Feb. 1967, E. F. Riek (ANIC); 1 ♂ 1 ♀ 15 mls S Wilmot, 2000 ft., 30 Jan. 1967, E. F. Riek (ANIC).

**Distribution:** Tasmania—all provinces; Victoria; New South Wales; Queensland.

68 *Asmicridea grisea* (Mosely)

Figure 354

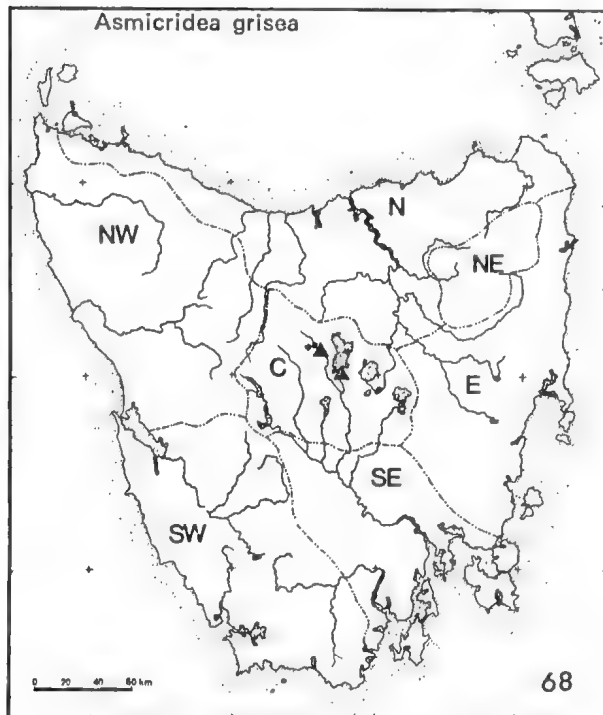
*Smicridea grisea* Mosely, 1933:217.

*Asmicridea grisea*, Mosely and Kimmins, 1953:336.

This species appears to be very closely related to *edwardsi*, the only reliable distinguishing character is the much narrower posterior wing in the male. More extensive material of *grisea* is required to investigate more fully the limits of variation in the anterior wing pattern, as well as to establish the morphological differences between the two species.

♂ genitalia of similar appearance to that of *edwardsi*.

♀ unknown.



**Type material:** Type ♂ Miena, Great Lake, Tas., 3300 ft., Dec. 1929, H. M. Stephens, Mosely collection (BMNH). Type not seen.

**Material examined:** Tasmania—2 ♂ Western Lakes, Jan. 1962, R. Cooper (NMV).

**Distribution:** Tasmania—C province.

Genus **Diplectronea** Westwood

*Diplectronea* Westwood, 1839:49; Ulmer, 1907:176; Mosely and Kimmins, 1953:336.

**Type species:** *Hydropsyche flavomaculata* Stephens (1836), nec. Pictet (= *Diplectronea felix* McLachlan, 1878).

Antennae slender, about as long or slightly shorter than anterior wings. Maxillary palpi 5-segmented; segment 1 very short, segment 2 longer than segments 3 or 4; segment 5 long, slender, flexible, barely as long as the first four combined. Head dorsally with large antero-lateral warts; anteromesal wart present; posterolateral warts very large; dorsal sutures present. Anterior wing rather broad, forks 1, 2, 3, 4 and 5 present; discoidal cell short. Slender lateral filament on abdominal sternite 5 present in both sexes. The male abdominal segments 6 and 7 each with a pair of internal membranous organs. Tibiae and tarsi of intermediate legs not dilated in female.

Spurs 2:4:4.

Only a small number of specimens of this genus are known from Tasmanian localities, and to them a total of four species names have been applied. *Diplectronea simplex* Jacquemart proved to be a member of the genus *Smicrophylax*; *D. bispinosa* Jacquemart is more likely to be a Victorian species if the date and locality on the label is correct (Neboiss, 1974c). One new species *D. lyella* is now added from Western Tasmania. A large female from this region (Arrowsmith Creek, Lyell h-way, 9 Dec. 1974, A. Neboiss) probably belongs to another yet undescribed species.

The species can be distinguished by the form of male genitalia and the differences are best appreciated by comparison of the drawings.

KEY TO TASMANIAN SPECIES  
(Males only)

1. Coxopodite stout, widened apically . . . 2
- Coxopodite slender, not widened apically . . . . . 3
2. Phallus with a pair of strongly chitinized claws near apex . . . . . *bispinosa*
- Phallus with an irregular group of stout spines at apex . . . . . *tasmanica*
3. Anterior wing with cross-vein r-m close

- to cross-vein closing median cell; below phallus a narrow, apically pointed and downturned mesal plate . . . . . *lyella*
- . Anterior wing with cross-vein r-m distad of median cell; without mesal plate below phallus . . . . . *castanea*

69 *Diplectrona castanea* Kimmins

*Diplectrona castanea* Kimmins in Mosely and Kimmins, 1953:342.

Anterior wing with median cell shorter than discoidal cell; cross vein r-m distad of median cell. The internal membraneous organs of segments 6 and 7 small, globular, not extending beyond the width of one segment. Wings and male genitalia have been figured in the original description.

♂ genitalia with tergite 10 formed by two narrow, fringed lobes, separated dorsally by a wide excision; phallus with one central lobe and two pairs of spines arising from the base; one pair short, upcurved, the second pair long, slender, acute, extending to the apex of median lobe. Inferior appendages two-segmented, coxopodite stout, wider at apex; harpago short, apex acute and abruptly bent inwards.

♀ unknown.

Length of anterior wing: ♂ 10 mm.

Type material: Type ♂ National Park, Tas., 3500 ft., 26 Dec. 1936, J. W. Evans (BMNH). Type not seen.

No new material has been available for study.

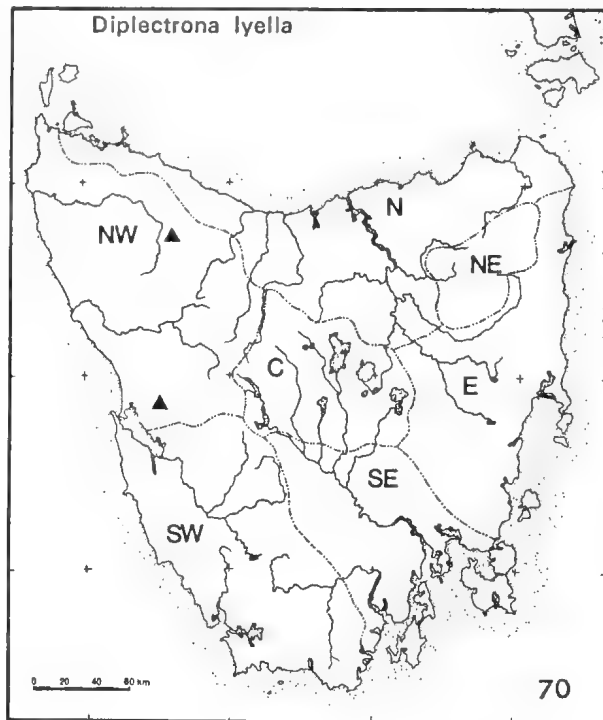
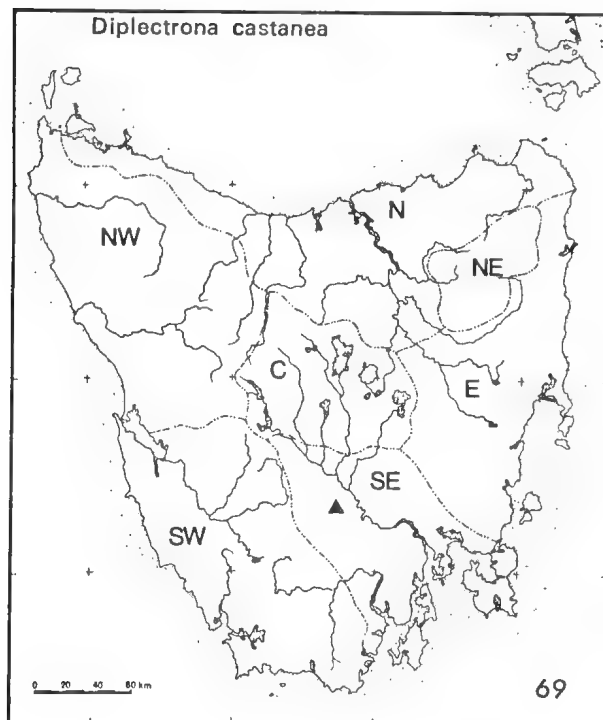
Distribution: Tasmania—SE province.

70 *Diplectrona lyella* sp. n.

Figures 355-362

Anterior wing with median cell as long or slightly longer than discoidal cell; cross vein r-m very close or touching median cell. The internal membraneous organs of segments 6 and 7 small, globular, not extending beyond the width of one segment.

♂ genitalia with a sharp, upcurved spine arising from the lateral margin of segment 9, the lower inner margin turned inward below phallus. These probably are the 'pair of triangular plates, set on edge' described by Kimmins (1953) in *D. castanea*. Tergite 10 formed by two narrow, fringed lobes, separated dorsally by a wide excision. Phallus with a central lobe, cleft apically and with minute protuberances on either side at about the middle; two pairs of



spines arising near the base, one pair short, upcurved, the second pair long, slender, acute, extending to the apex of the median lobe; below phallus a narrow, triangular, apically pointed and downturned plate. Inferior appendages two-segmented, coxopodite stout, widened apically; harpago short, tapering and curved inwardly at apex.

♀ unknown.

*Length of anterior wing:* ♂ 9.5-10 mm.

*Type material:* Holotype ♂ (T5143) King River, Tas., 5 Nov. 1961, N. Dobrotworsky (NMV); paratype ♂ (T5135) Hellyer River Gorge, Tas., 2 Dec. 1972, P. Zwick (NMV).

*Distribution:* Tasmania—NW province.

## 71 *Dipletrona bispinosa* Jacquemart

### Figure 363

*Dipletrona bispinosa* Jacquemart, 1965b:25; Neboiss, 1974c:14.

The holotype male is dissected and mounted on three separate microscope slides with the original label removed from the pin and glued onto the slide with the wings. The examination of this specimen shows that the length of the anterior wing is slightly less than 12 mm and not 21 mm as given in the description. The locality label 'Sassafras ? 20.x. A. Tonnoir' was not apparently written by the collector himself, nor does it include information regarding the State or year of collection, although '1923' was stated by Jacquemart in the original description, in which the locality also was misspelled as 'Sassapras'.

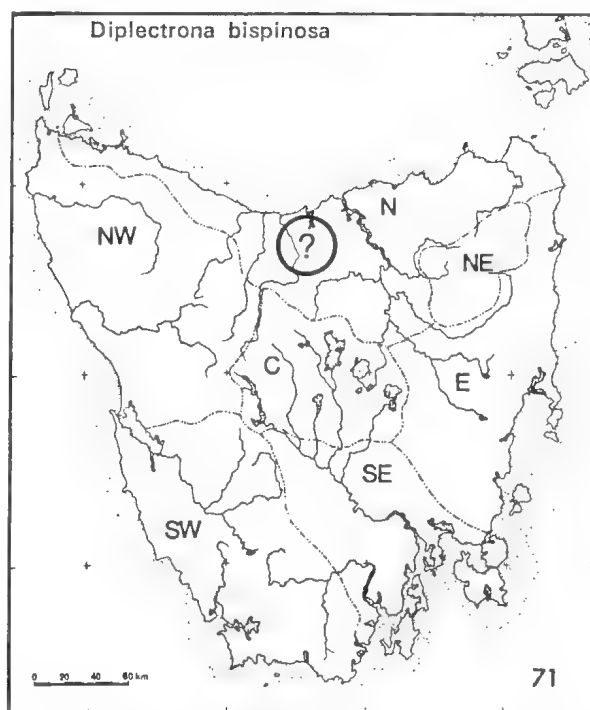
The sequence of places visited by Tonnoir at the end of 1922 and early 1923 was reconstructed by Neboiss (1974c), who showed that the holotype of *D. bispinosa* was most likely collected at Sassafras in the Dandenong Ranges, Victoria, assuming that the collecting date was in fact 20 Oct. 1922, when Tonnoir was in Victoria. If, on the other hand, the date on the original label has been 29 October (1922), in which the digit '9' has been mistaken for '0', then this corresponds to the time when Tonnoir was on the way from Burnie to Launceston and that created opportunity for him to collect in the vicinity of Sassafras, Tasmania, located 15 km SE of Devonport.

Further specimens of this species are required to clarify the question of distribution, but so far no specimens have been available to the present author either from Victoria or Tasmania.

♂ *genitalia:* lateral margin of segment 9 extending inwardly to a rounded lobe; phallus slightly curved downwards, with a pair of strongly chitinous spurs on the ventral side, close to the apex; inferior appendages slender, two-segmented; coxopodite with a spur near apex, harpago curved inwardly and apically pointed. The internal membranous organs of segments 6 and 7 large, oval, extending anteriorly beyond the width of one segment.

♀ unknown.

*Length of anterior wing:* ♂ 12 mm.



*Type material:* Holotype ♂ Sassafras ? 20.x. A. Tonnoir (IRScNB), mounted on three microscope slides. Type seen.

*Distribution:* Tasmania ? (Victoria ?)

## 72 *Dipletrona tasmanica* Jacquemart

### Figure 364

*Dipletrona tasmanica* Jacquemart, 1965b:27.

This is the smallest of the Tasmanian *Dipletrona* species. Anterior wings brownish; median

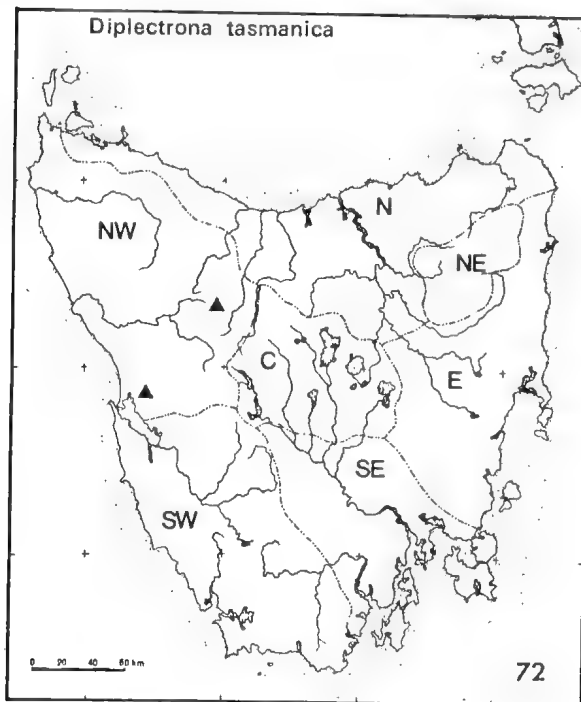


cell as long or slightly longer than discoidal cell; cross-vein r-m close or touching median cell. The internal membranous organs of segments 6 and 7 small, globular, not extending beyond the width of one segment.

♂ genitalia with segment 9 short, hood-shaped, lateral margin produced into an upward directed, pointed lobe; apical margin of tergite 9 with a short and wide central excavation, postero-lateral angles slightly produced, blunt. Phallus slender, terminating with ventrally situated cluster of spines at the apex. Inferior appendages two-segmented, slender; coxopodite long, somewhat cylindrical, harpago short, curved inwards, apically pointed.

♀ unknown.

Length of anterior wing: ♂ 6.6.5 mm.



*Type material:* Holotype ♂ Cradle Mtn., Tas., 12 Jan. 1923, A. Tonnoir (IRScNB), specimen dissected and mounted on three microscope slides. Type seen.

*Material examined:* Tasmania—1 ♂ 10 km SW Queenstown, 11 Feb. 1971, A. Neboiss (NMV).

*Distribution:* Tasmania—NW province.

#### SUPERFAMILY LIMNAPHILOIDEA

Maxillary palpi with terminal segment not annulated. Larvae sub-eruciform or eruciform; head hypognathous; constructing portable cases.

#### 9 Family PLECTROTARSIDAE Mosely (1953)

This endemic Australian family includes unusual moth-like, day-flying caddis flies. The main centre of distribution is in the Southeast of Australia and Tasmania, with only one rare species known from Southwestern Australia. The adults can be observed flying around small to medium size shrubs in damp areas in the vicinity of water during the middle of the day in bright sunshine. So far all attempts to locate the larvae have failed, although the first instar larvae were hatched from eggs by E. F. Riek (personal communication).

*Family diagnosis:* Ocelli present; antennae not exceeding the length of anterior wing, moderately stout to stout, basal segment more or less thickened; mouth parts either normal or elongate to form a proboscis; maxillary palpi cylindrical, three-segmented in male, five-segmented in female. Mesoscutum with two pairs of indistinct warts, the anterior pair elongate, posterior pair close to scutellum, small, rounded. The warts on scutellum either rounded or elongate, somehow connected in the middle.

Wings covered with dense pubescence; anterior wing with forks 1, 2, 3 and 5 or 1, 2, 3, 4 and 5 present; posterior wing with  $R_1$  strongly bent downward where it joins  $R_2$  or ends blindly before reaching wing margin; discoidal cell small; strong frenular bristles at humeral angle.

Male genitalia with inferior appendages two-segmented.

Spurs 1:2:4; 1:4:4 or 2:2:4; tibiae and tarsi armed with strong spines.

#### KEY TO GENERA OF PLECTROTARSIDAE

1. Mouth parts distinctly elongate to form a proboscis; spurs 1:4:4 . . . *Plectrotarsus*
- Mouth parts not elongate; mid-tibia with 2 spurs only . . . . . 2
2. Spurs 2:2:4; posterior wing with anal field broad with six anal veins . . . *Liapota*



- . Spurs 1:2:4; posterior wing with anal field narrow, with five anal veins . . . . . *Nanoplectrus*

### Genus *Plectrotarsus* Kolenati

*Plectrotarsus* Kolenati, 1848:94; Ulmer, 1907:99; Cummings, 1914:25; Tillyard, 1918:647; Mosely, 1936a:396; Mosely and Kimmins, 1953:21; Neboiss, 1959:91.

*Type species:* *Plectrotarsus gravenhorsti* Kolenati, 1848.

Wings densely covered with pubescence; anterior wing with forks 1, 2, 3 and 5 or 1, 2, 3, 4 and 5 present; discoidal cell long and narrow, thyridial cell about the same length; posterior wing with forks 1, 2 and 5 present in both sexes, discoidal cell short, anal field broad.

Mouth parts elongate in shape of a proboscis; antennae about as long as anterior wing, stout; segment 1 large, segment 2 small.

Spurs 1:4:4.

Two species in Tasmania, one of which *P. tasmanicus* is endemic.

### KEY FOR SEPARATING TASMANIAN *PLECTROTARSUS* SPECIES

1. Anterior wing covered with orange-brown and dark, often iridescent blue pubescence . . . . . *gravenhorsti*
- . Anterior wing covered with concolorous dark brown pubescence, with narrow white transverse line across the wing at anastomosis . . . . . *tasmanicus*

### 73 *Plectrotarsus gravenhorsti* Kolenati

Figures 365-366

*Plectrotarsus gravenhorsti* (*gravenhorstii* by many authors) Kolenati, 1848:94; Walker, 1852:97; Ulmer, 1904:56; 1905a:20; 1907:100; Mosely, 1936a:399; Mosely and Kimmins, 1953:25; Neboiss, 1959:94.

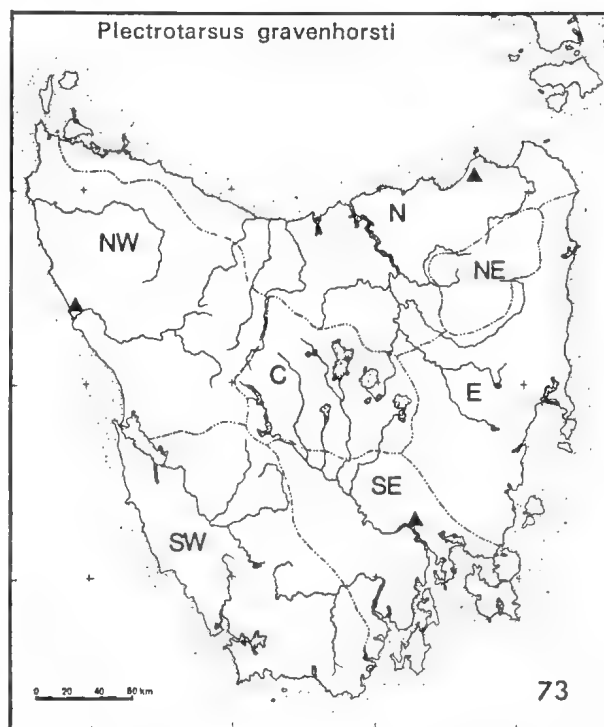
This is one of the most colourful and well known caddis-fly species. The orange-brown and dark brownish-black, often iridescent blue pubescence, often even with some small areas of white on anterior wings easily identifies this species. The pattern is variable.

♂ genitalia with posterior margin of sternite 9 at the centre produced in two rounded lobes,

separated by deep excision; superior appendages short, slightly curved inward, apically rounded. Segment 10 hood-shaped, triangular in dorsal view, apex excised. Inferior appendages two-segmented; coxopodite large, convex, harpago slender, digitiform, curved inward, arising from the apically truncate, upper angle of the coxopodite. Phallus widened at the middle, distal end dorso-ventrally compressed, apex rounded.

♀ abdomen terminates bluntly with large, hood-shaped plate dorsally and a narrower, trough-shaped plate ventrally.

*Length of anterior wing:* ♂ 6.5-8.5 mm; ♀ 7.5-10 mm.



*Type material:* Type 'Australia occidentali', location unknown. Type not seen.

*Material examined:* Tasmania—2 ♂ 1 ♀ Bridge-water, Derwent River, 21 Feb. 1964, A. L. Dyce and M. D. Murray (ANIC, NMV); 1 ♀ Rupert Pt. 3 mls N of Pieman R, 29 Dec. 1953, T. G. Campbell (ANIC); 3 ♂ 2 ♀ Waterhouse Estate 25 mls NE of Scottsdale, 17 Jan. 1948, Key, Carne, Kerr (ANIC, NMV).

*Distribution:* Tasmania—N, NW and SE provinces; Victoria; New South Wales.

74 *Plectrotarsus tasmanicus* Mosely

Figures 367-373

*Plectrotarsus tasmanicus* Mosely, 1936a:396; Mosely and Kimmins, 1953: 21; Neboiss, 1959:94; Jacquemart, 1965b: 3.

*Plectrotarsus gravenhorsti* var. Walker, 1852: 97.

*Plectrotarsus gravenhorsti*, Banks nec. Kolenati, 1913: 234.

This species is easily distinguished from *P. gravenhorsti* by the differently coloured anterior wing, which is dark brownish-black with a more or less conspicuous transverse line at the anastomosis extending across the entire wing, as well as two white spots, one near the base of fork 2, the other at the middle of the thyridial cell; a few white hairs at several other places are less conspicuous.

♂ genitalia very similar to that of *P. gravenhorsti*, but superior appendages elongate triangular, apex blunt and the space separating inferior appendages in the ventral view is a narrow 'V' shape, nearly pointed at the base.

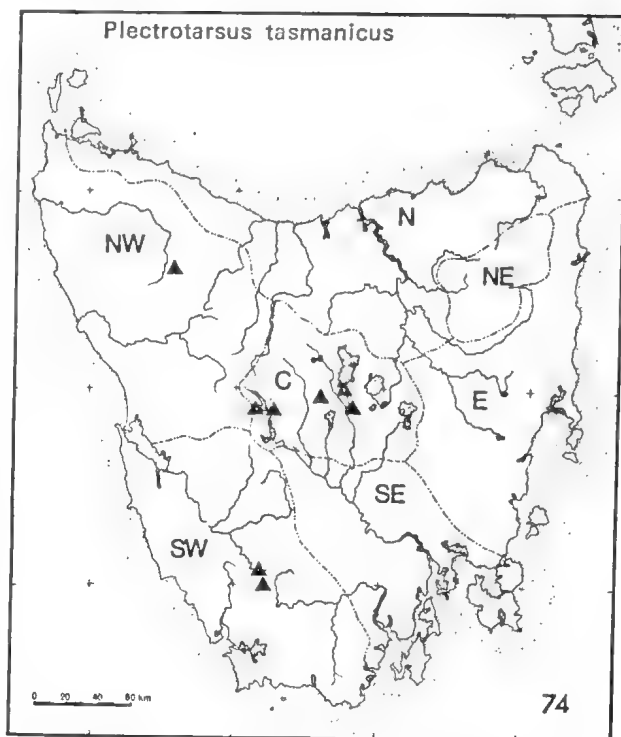
♀ abdomen terminates bluntly with large dorsal hood and a ventral trough-shaped lip.

Specimens from Southwest Tasmania (Lake Pedder and Huon Plains) and those from King Island, differ slightly from the typical form as described from the vicinity of the Great Lake. The specimens from King Island on the average are larger in size and in the male genitalia segment 10 is somewhat shorter, whereas the specimens from the Southwestern localities are smaller, generally darker, with entirely black mesothorax and slightly different shape of the phallus. These differences are not considered to be sufficient to warrant specific separation, but apparently represent geographically separated populations.

*Length of anterior wing:* ♂ 8-9.5 mm; ♀ 8-11 mm.

*Type material:* Type ♂ Miena, Tas., Dec. 1930, C. Parker (BMNH). Type not seen.

*Material examined:* Tasmania—47 ♂ 16 ♀ Penstock Lagoon, 8 Jan. 1964, E. F. Riek (ANIC; NMV); 1 ♂ Little Pine Lagoon, 16 Feb. 1967, E. F. Riek (ANIC); 17 ♂ 10 ♀ Derwent River 2 km NW Derwent Bridge, 12 Feb. 1971, A. Neboiss (NMV); 1 ♂ 2 ♀ Lake St. Clair, 13 Feb. 1967, E. F. Riek (ANIC); 1 ♂ 2 ♀ Fossey River 10 mls S of Hellyer Gorge, 5 Feb. 1967, E. F. Riek (ANIC); 3 ♂ 7 ♀ King Island, Jan. 1907, J. A. Kershaw (NMV); 1 ♂ Lake Pedder, 31 Jan. 1965, A. Neboiss (NMV); 1 ♂ Huon Plains nr. Scotts Peak, 8 Feb. 1965, A. Neboiss (NMV).



*Distribution:* Tasmania—C, NW and SW provinces.

Genus *Liapota* Neboiss

*Liapota* Neboiss, 1959:95.

*Tasmania* Jacquemart, 1965a:2 *syn. nov.*

*Type species:* *Liapota lavara* Neboiss, 1959.

Ocelli present; antennae stout, basal segment large, segment 2 short, segment 3 and subsequent ones slightly longer than second. Mouth parts not produced into proboscis. Anterior wing with forks 1, 2, 3 and 5 present in both sexes, all sessile; discoidal cell long and narrow, thyridial cell about as long or slightly longer than discoidal cell; posterior wing with forks 1, 2 and 5 present; four frenular bristles at humeral angle.

Spurs 2:2:4.

75 *Liapota lavara* Neboiss

Figures 374-378

*Liapota lavara* Neboiss, 1959:95.

*Tasmania caparti* Jacquemart, 1965a:2 *syn. nov.*

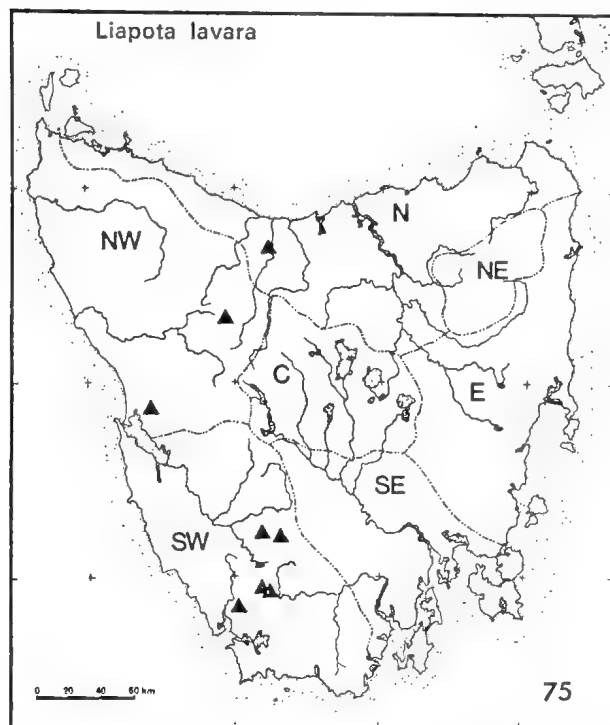
A small, very distinctive day-flying caddis-fly, usually found in low scrubland, flying among the vegetation during the middle of the day in bright sunshine. The colourful, golden-yellow

pubescence with dark-brown and white pattern is very characteristic and readily identifies the species.

♂ genitalia with inferior appendages two-segmented, proximal segment broad, curved downward, distal segment small, turned down and inward; phallus with upper distal part widened laterally.

♀ abdomen terminates bluntly with a hood-shaped dorsal plate with a pair of triangular ventral plates.

Length of anterior wing: ♂ 5.5-6 mm; ♀ 5 mm.



*Type material:* Holotype ♂ Cradle Mtn., Tas., Carter and Lea; allotype ♀ Wilmot, Tas., Carter and Lea (SAM). Type seen.

Holotype ♂ of *Tasmania caparti* Jacq. Cradle Mtn., Tas., 27 Jan. 1923, A. Tonnoir (IRScNB), dissected and mounted on five microscope slides. Type seen.

*Material examined:* Tasmania—25 ♂ 1 ♀ Junction Creek, West Arthur Plains, 6 Feb. 1966, A. Neboiss (NMV); 7 ♂ 2 ♀ West Arthur Plains, 7 Feb. 1965, A. Neboiss (NMV); 5 ♂ Spring River, 4 Feb. 1966, A. Neboiss (NMV); 1 ♀ Wedge River 30 mls W of Maydena, 26 Feb. 1967, A. Neboiss (NMV); 1 ♀ 40 mls W of Maydena, 25 Feb. 1967, A. Neboiss (NMV); 1 ♂ 10 mls E Strahan, 20 Feb. 1963, Com-

mon and M. S. Upton (ANIC); 1 ♂ same loc, 5 Feb. 1967, E. F. Riek (ANIC).

*Distribution:* Tasmania—NW and SW provinces.

### Genus *Nanoplectrus* gen. nov.

*Type species:* *Nanoplectrus truchanasi* gen. et sp. n.

Ocelli present; maxillary palp 3-segmented in male; segment 1 short, segments 2 and 3 long, slender; mouth parts not produced into proboscis; anterior wing elliptic with forks 1, 2, 3 and 5 present, discoidal cell closed, rather broad; posterior wing elongate oval,  $R_1$  bent downward and joined to  $R_2$ ; anal area of the wing not expanded, with five anal veins; three frenular bristles at the humeral angle. Male genitalia with two-segmented inferior appendages.

Spurs 1:2:4; tibial spurs yellow, spines dark, brownish-black.

The wing venation and different spur formula separate this from the other genera.

### 76 *Nanoplectrus truchanasi* sp. n.

Figures 379-389

This small species was captured flying among low vegetation at the same time and locality where numerous *Liapota lavara* specimens were collected.

♂ genitalia is basically of similar plan to that in *L. lavara* but differs in details; sternite 8 midventrally produced into a broad, oval lobe; lateral lobe of segment 9 narrow, truncate apically; inferior appendages two-segmented, downturned. Phallus with lateral, slightly posteriorly directed projections.

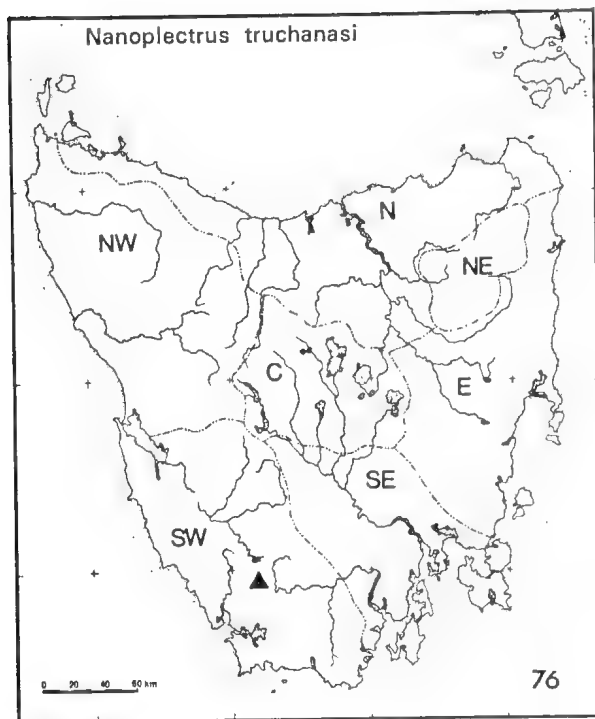
♀ unknown.

Length of anterior wing: ♂ 4 mm.

*Type material:* Holotype ♂ (T5205) Junction Creek, West Arthur Plains, Tas., 6 Feb. 1966, A. Neboiss (NMV).

*Distribution:* Tasmania—SW province.

This species is dedicated to Olegas Truchanas, a Lithuanian-born conservationist, explorer and naturalist, who lost his life on 6 January 1972, while exploring the Gordon River Gorge in Southwest Tasmania.



## 10 Family LIMNEPHILIDAE Kolenati (1859)

The family is widely distributed in a great diversity of habitats in the northern hemisphere, but known from only a small number of species south of the equator. All of the known Australian species occur in clear, rapidly flowing mountain streams.

**Family diagnosis:** Ocelli always present; antennae as long as, or slightly shorter than the anterior wings, moderately stout, basal segment enlarged; maxillary palpi in male three-segmented, in female five-segmented, slightly pubescent; labial palpi small.

Legs with variable number of tibial spurs, according to the respective genera, the anterior ones never with more than one spur; tibiae and tarsi usually armed with strong spines.

Anterior wings with discoidal cell always closed, median cell absent; posterior wings always much broader and less pubescent than the anterior ones, often iridescent, discoidal cell closed (except in the non-Australian subfamily Apataniinae).

There is only one genus in Australia.

## Genus *Archaeophylax* Kimmins

*Archaeophylax* Kimmins in Mosely and Kimmins, 1953:27; Schmid, 1955a:92.

**Type species:** *Archaeophylax ochreus* Mosely, 1953.

Spurs 1:2:2; anterior wings broad, rounded at apices, discoidal cell in both wings long and narrow, longer than the footstalk. Forks 1, 2, 3 and 5 present in both wings. Face slightly produced.

The larvae without dorsal tubercle on the first abdominal segment, gills well developed, multi-branched; lateral line extends from third to eighth segment. The cases are straight or slightly bent, constructed from moderately small to coarse sand grains or pieces of vegetation.

There are only two closely related species in Tasmania and they can be distinguished by the colour of the wings and details of the male genitalia.

## 77 *Archaeophylax ochreus* Mosely Figures 386-389

*Archaeophylax ochreus* Mosely in Mosely and Kimmins, 1953:27; Neboiss, 1958:163 (larva).

This is one of the largest of Australian caddis-flies. Wings broad, rounded apically, colour variable from yellowish to greyish-brown, dark specimens usually also having the tibiae and tarsi blackish.

♂ **genitalia:** distal margin of tergite 9 produced into a rounded lobe, below and distad of which is the semi-membranous tergite 10 as a short, medially deeply clefted, hood-shaped plate; superior appendages short, broader at base, apex truncate in lateral aspect; a pair of prominent, curved, apically downturned and pointed processes arise on either side of phallus; inferior appendages small, in the form of a short rod; ventral margin of segment 9 extended distally to a broad, apically truncate plate, slightly excised in the middle. Phallus consists of distally pointed median lobe with lateral flaps at the middle, and a pair of long parameres which ventrally carry elongate group of short bristles.

♀ **genitalia:** abdomen terminates bluntly with broad, slightly notched dorsal plate.

**Length of anterior wing:** ♂ ♀ 15-18 mm.

Larvae of this widely distributed species are usually found in calm water pools under stones

in otherwise rapidly flowing mountain streams.

**Case**—cylindrical, straight or slightly bent, constructed of various materials of plant or mineral origin. Plant material includes small sticks, pieces of dead leaves, bits of bark and other vegetable debris, arranged in criss-cross manner obliquely to the axis of the case. At some localities plant material is intermixed with small stones and sand. Length up to 22 mm, width to 7 mm.

**Larva**—eruciform, cylindrical. Head elongate, yellowish-brown, with a pair of paler spots between the eyes; irregular pattern of oval spots on genae, and a ringlike pattern on the narrow dorsal part of clypeus; mandibles black, broadly obtuse, 4-toothed; gular sclerite pointed aborally.

**Thorax**—pronotum sclerotized, yellowish-brown, with pale longitudinal median line, and darker posterior margins; mesonotum sclerotized, part with dark posterior margin and a dark spot laterally on each side; metanotum with small sclerotized patches only.

**Abdomen** cylindrical, pale yellow or whitish, lateral line extending from segments 3 to 8; abdominal segment 1 with lateral protuberances

only; anal claws short, each with a small additional hook near the base.

**Type material:** Type ♂ Cuvier River, Tas., Feb. 1941 (BMNH). Type not seen.

**Material examined:** Tasmania—21 ♂ 1 ♀ Lake Dobson, 20 Feb. 1967, E. F. Riek and A. Neboiss (ANIC; NMV); 3 ♂ 1 ♀ Hellyer Gorge, 4 Feb. 1967, E. F. Riek (ANIC); same loc. 4 ♂ 9 Feb. 1971, A. Neboiss (NMV); 1 ♂ Murchison River, 5 Feb. 1967, E. F. Riek (ANIC); 1 ♂ Florentine River 7 mls W Maydena, 25 Feb. 1967, E. F. Riek (ANIC); 7 ♂ Franklin River 20 km SW of Derwent Bridge, 11 Feb. 1971, A. Neboiss (NMV); 3 ♂ Franklin River, 10 Feb. 1967, E. F. Riek (ANIC); 1 ♂ St. Columba Falls, Pyengana, 21 Feb. 1971, A. Neboiss (NMV); 1 ♂ St. Patrick's River, Targa, 22 Feb. 1971, A. Neboiss (NMV); 8 ♂ 2 ♀ Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971, A. Neboiss (NMV); 1 ♂ Henty River 12 km NW of Queenstown, 10 Feb. 1971, A. Neboiss (NMV); 7 ♂ 1 ♀ Huon-Picton River junction, 17-18 Feb. 1967, E. F. Riek and A. Neboiss (ANIC; NMV); 3 ♂ Huon River nr. Blakes Opening, 9 Feb. 1966, A. Neboiss (NMV); 9 ♂ Cracroft River, 8 Feb. 1966, A. Neboiss (NMV); 4 ♂ 1 ♀ Ouse River 5 mls W of Miena, 28 Feb. 1967, E. F. Riek (ANIC); 1 ♂ Dove River, Cradle Mtn. Nat. Park, 14 Dec. 1974, A. Neboiss (NMV); 2 ♂ Liffey River 5 km W of Liffey, 2 Dec. 1974, A. Neboiss (NMV); 1 ♂ Pine Creek 5 km N of Breona, 16 Dec. 1974, A. Neboiss (NMV); 1 ♂ Forth Falls, 29 Jan. 1967, E. F. Riek (ANIC); 1 ♂ 10 mls E of Strahan, 6 Feb. 1967, E. F. Riek (ANIC); 2 ♂ Mt Barrow 2500 ft, 3 Mar. 1963, Common and Upton (ANIC); 1 ♂ 5 mls S of Waratah 1800 ft, 16 Feb. 1963, Common and Upton (ANIC); 1 ♂ 2 ♀ 12 mls S of Deloraine 2200 ft, 5 Mar. 1963, Common and Upton (ANIC); 1 ♂ Huon Crossing, Port Davey Track, 8 Feb. 1965, A. Neboiss (NMV).

**Larvae and pupae only:** Russell Falls, 23 Feb. 1967, E. F. Riek (ANIC); Mt Rufus, 14 Feb. 1967, E. F. Riek (ANIC); King River 8 mls E of Queenstown, 8 Feb. 1967, E. F. Riek (ANIC); Lake Augusta 4000 ft, 26 Jan. 1966, G. F. Edmunds (ANIC); Little Pine River, 16 Feb. 1967, E. F. Riek (ANIC); Western Lakes, Jan. 1962, Cooper (NMV).

**Other recorded localities:** Mt Wellington.

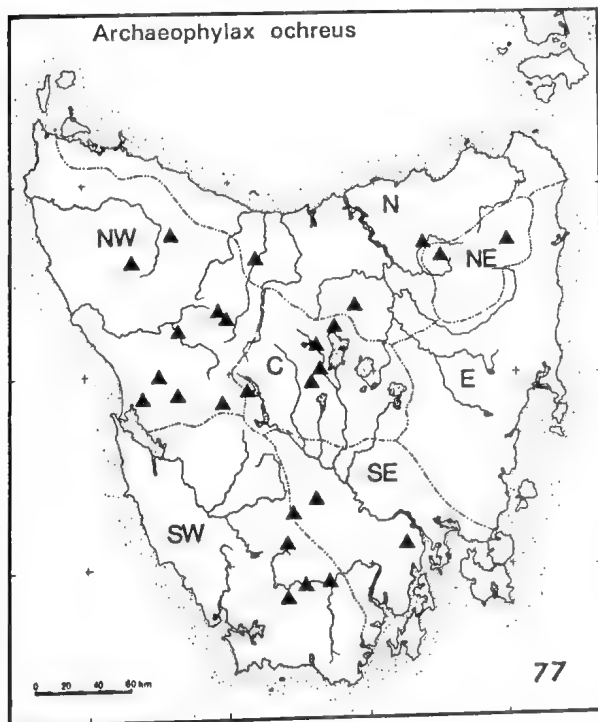
**Distribution:** Tasmania—all provinces except E province. Victoria; New South Wales.

#### 78 *Archaeophylax vernalis* sp. n.

Figures 390-393

Insect dark, smoky-brown, closely related to *ochreus*, but can be separated by its smaller size, darker colour and details of male genitalia.

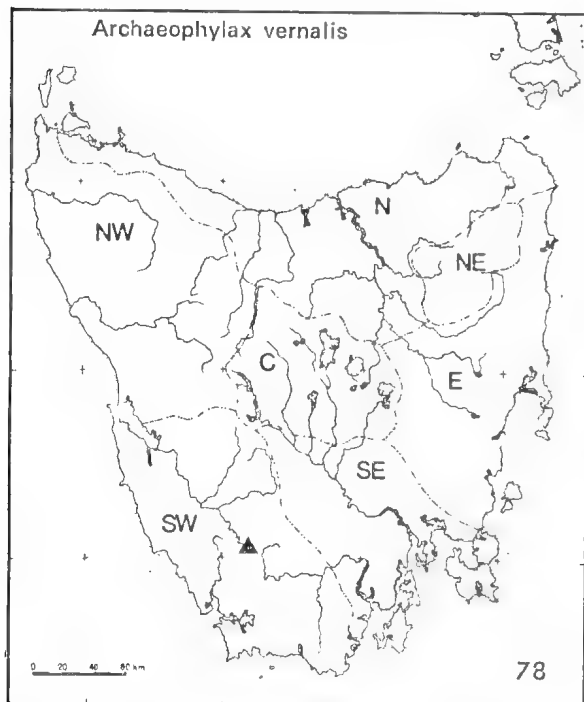
♂ **genitalia:** distal margin of tergite 9 produced into a rounded lobe; semi-membranous hood-shaped tergite 10 with small median excision; superior appendages short, triangular; a pair of prominent processes on either side of phallus, slender, apically pointed without the



distinctive rounded excision near the base as in *ochreus*; inferior appendages small, in form of a short, apically truncate rod; ventral margin of segment 9 extended distally and forms a broadly truncate plate; phallus with slenderly pointed median lobe, parameres with elongate group of short bristles near the apex.

♀ unknown.

Length of anterior wing: ♂ 14 mm.



*Type material*: Holotype ♂ (T5206) Lake Pedder, Tas., 12 Mar. 1972, A. Neboiss (NMV).

*Distribution*: Tasmania—SW province (known from the type locality only).

11 Family KOKIRIIDAE McFarlane  
(1964)

Specimens resembling the New Zealand species *Kokiria miharo* McFarlane, were found among material collected in 1965 at Lake Pedder, Southwest Tasmania. Several attempts were made to obtain more material, but it was not until early 1972, when a single *Kokiria* like larva was found in the lake. Unfortunately, the lake, together with part of the surrounding National Park, was flooded by the Hydro-electric scheme, thus destroying this unique and

unexplored locality, which produced two of the three Tasmanian kokirid species. They represented two quite distinct genera, one of them having only a single spur on the anterior tibia, although all other diagnostic features clearly indicate its affinities with this family. Therefore the reduced number of anterior spurs are added to the family diagnosis. The family was characterized and recorded for the first time from Australia by Neboiss (1974b).

*Family diagnosis*: Ocelli absent; antennae about as long as anterior wing, basal segment longer than broad, not bulbous; mouth parts elongate in form of proboscis; maxillary palpi cylindrical, 3-segmented in male, 5-segmented in female. Mesoscutum and scutellum each with a pair of warts. Anterior wing with  $R_1$  curved forward, either joining Sc for a short distance or briefly connected to it basad of pterostigma before diverging with an even concave curve to the wing margin. Posterior wing with discoidal cell open;  $R_1$  ending blindly, becoming untraceable distally, or joining Sc shortly before wing margin; 3-5 strong frenular bristles at humeral angle. Male genitalia with inferior appendages single segmented.

Spurs 1:4:4 or 2:4:4, covered with fine pubescence.

KEY FOR SEPARATING AUSTRALIAN  
GENERA FROM THE TYPE GENUS  
(Males only)

1. Warts on scutellum short, rounded; discoidal cell in anterior wing short . . . . . (New Zealand) *Kokiria*
- Warts on scutellum elongate, discoidal cell in anterior wing long . . . . . 2
2. Tibial spurs short, 1:4:4 . . . . . (Tasmania) *Taskiropsyche*
- Tibial spurs long, 2:4:4 . . . . . 3
3. Anterior wing with thyridial cell about as long as discoidal cell . . . . . (Victoria) *Tanjistomella*
- Anterior wing with thyridial cell distinctly longer than discoidal cell . . . . . (Tasmania) *Taskiria*

Genus **Taskiria** gen. n.

*Type species*: *Taskiria austera* gen. et sp. n.

Ocelli absent. Mouth parts extended to a slender proboscis; maxillary palp in male

3-segmented, individual segments cylindrical, all approximately the same length; in female 5-segmented; antennae stout, about as long as the anterior wing; the head dorsally with two pairs of warts, the anterior pair small, oval, the posterior pair much larger, broadly elongate.

Anterior wings with discoidal cell long, thyridial cell about 1.5 times longer than the discoidal cell; forks 2, 3 and 5 present, forks 2 and 5 sessile. Posterior wings distinctly wider than the anterior wings, discoidal cell open, forks 1, 2 and 5 present; 3-5 frenular bristles at the humeral angle.

Spurs 2:4:4, strong, tapered to pointed apex.

#### KEY FOR SEPARATING SPECIES (Males only)

1. Central lobe of segment 10 separated from lateral lobes by deep cleft . . . . . *austera*
- No deep cleft between central and lateral lobes . . . . . *mccubbini*

#### 79 *Taskiria austera* sp. n.

Figures 394-404

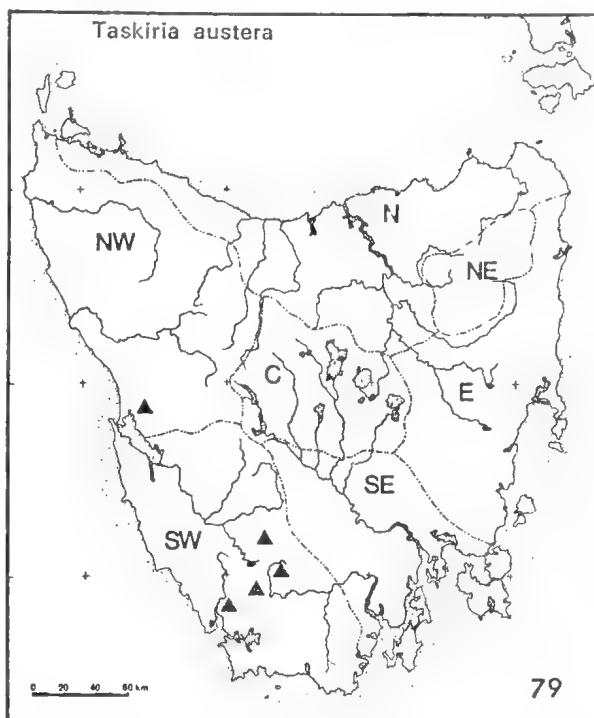
Dark, blackish-brown species, head and thorax fuscous, nitid, covered with coarse, golden hairs; mouth parts and maxillary palpi brownish; abdomen dark brown, legs paler; anterior wings fuscous, densely covered with dark, rather coarse fuscous pubescence; posterior wings smoky hyaline, slightly darker distally, covered with dense fuscous pubescence. Legs slender, with strong, tapered tibial spurs, covered with fine pubescence; tibiae with several strong spines; tarsal segments with spines arranged in two, more or less parallel rows. Female about the same size or only slightly larger, body and wing colouring similar to the male.

♂ *genitalia*: dorsal margin of segment 10 produced apically to a slender triangular central lobe, truncate at apex, and a pair of curved lateral lobes, pointed apically and separated from the centre lobe by a deep cleft. Phallus long, curved downward and slightly expanded dorso-ventrally near the apex. Inferior appendages single segmented, somewhat broader at base, curved inward and slightly tapering distally.

♀ *genitalia*: segment 10 in form of a short,

ventrally open semi-tubular piece; sternite 10 from the side lip-like, with V-shaped central incision and down-turned apices.

Length of anterior wing: ♂ 7-8 mm; ♀ 7.5-8.25 mm.



*Type material*: Holotype ♂ (T5139), allotype ♀ (T5140), 15 ♂ 3 ♀ paratypes (T5141-T5158) West Arthur Plains, Tas., 6 Feb. 1965; 2 ♂ paratypes (T5159-T5160) Junction Creek, West Arthur Plains, Tas., 6 Feb. 1966; 2 ♂ paratypes (T5161-T5162) Wedge River, Tas., 17 Feb. 1971; 1 ♂ paratype (T5163) Condominion Creek, Tas., 15 Feb. 1971; all specimens collected by A. Neboiss (NMV).

*Other material examined*: Tasmania—1 ♂ 1 ♀ West Arthur Plains, 6 Feb. 1965, A. Neboiss (NMV); 1 ♀ Spring River, 4 Feb. 1966 A. Neboiss (NMV); 1 ♀ 10 mls E Strahan, 6 Feb. 1967, E. F. Riek (ANIC).

*Distribution*: Tasmania—NW and SW provinces.

#### 80 *Taskiria mccubbini* sp. n.

Figures 405-411

Dark brown species of medium size, slightly larger, but distinctly paler than *T. austera*. Eyes black; tibia with several short spines, on tarsal segments the spines are arranged in two some-

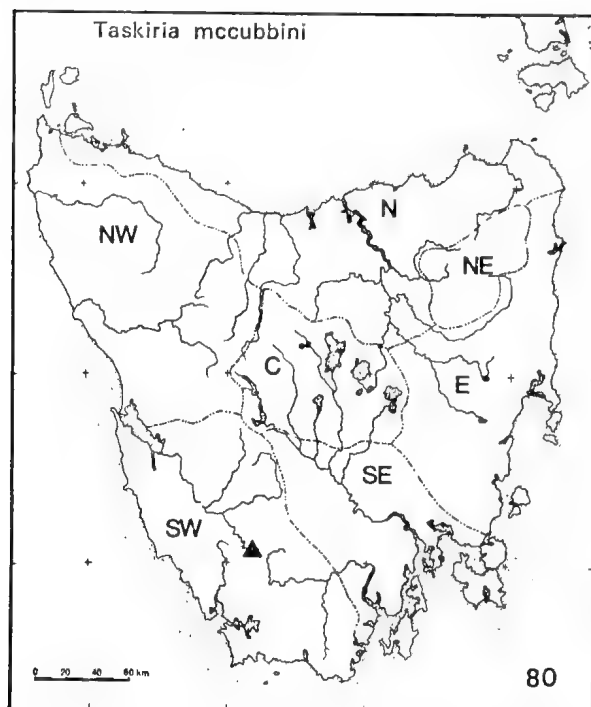


what parallel rows. Wing venation as described for the genus.

♂ *genitalia distinct*: central lobe of segment 10 excised at apex, not separated from lateral lobes by deep cleft; inferior appendages broad at base, abruptly tapering dorso-ventrally, somewhat flattened inwardly curved apices. Phallus long and slender, curved downward.

♀ unknown.

*Length of anterior wing*: ♂ 9.9.5 mm.



*Type material*: Holotype ♂ (T5164), paratype ♂ (T5165) Lake Pedder, Tas., 1 Feb. 1965, A. Neboiss (NMV).

*Distribution*: Tasmania—SW province (known from the type locality only).

This species has been named after Mr C. McCubbin, artist, entomologist and conservationist, whose urge and enthusiasm to explore Southwest Tasmania, led to the discovery of this and many of the other species described in this paper.

Genus **Taskiropsyche** gen. nov.

*Type species*: *Taskiropsyche lacustris* gen. et sp. n.

Ocelli absent. Mouth parts extended to a short and rather broad proboscis; maxillary

palp in male 3-segmented, terminal segment curved, longer than second, covered with short, dense setae; antennae moderately slender, slightly shorter than the anterior wings, head dorsally with two pairs of warts, the anterior pair rounded, posterior ones elongate, slightly larger.

Anterior wing with discoidal cell long; thyridial cell 1.5 times longer than the discoidal cell; forks 2, 3 and 5 present, forks 2 and 5 sessile. Posterior wing about as wide or only slightly wider than the anterior wing; discoidal cell open, forks 2 and 5 present; 4-5 frenular bristles at the humeral angle.

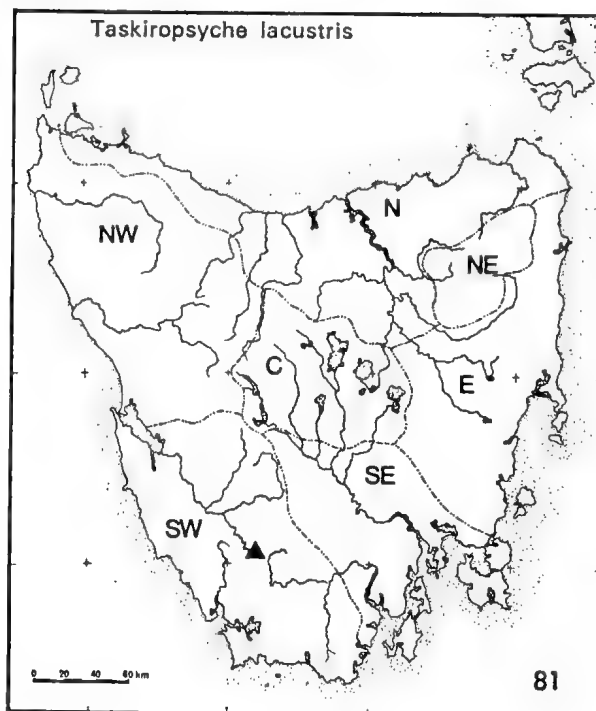
Spurs 1:4:4, rather short.

81 *Taskiropsyche lacustris* sp. n.

Figures 412-420.

In addition to the generic description, the following details characterize the species.

Dark brown species of moderate size. Frons covered with stout, pale setae; eyes black; anterior wing with a narrow group of short setae along the anal margin; posterior wing with 4-5 frenular bristles at the humeral angle, and a few, rather long, stiff bristles along the costal margin.





♂ genitalia with segment 10 gradually tapering to a narrow, rounded apex, below which there is a pair of small lobes; inferior appendages slender, in- and upward curved; phallus bilobed apically.

♀ unknown.

Length of anterior wing: ♂ 8.5-9.5 mm.

Type material: Holotype ♂ (T5166), 3 ♂ paratypes (T5167-T5169) Lake Pedder, Tas., 1 Feb. 1965, A. Neboiss (NMV).

Distribution: Tasmania—SW province (known from the type locality only).

## 12 Family OECONESIDAE Tillyard (1921)

**Family diagnosis:** Ocelli absent. Antennae about as long as, or slightly longer than anterior wings, first segment enlarged, shorter than head; maxillary palpi one or two-segmented in males, five-segmented in females. Wings broad, venation differing in sexes, often reduced or modified in males.  $R_1$  joins  $R_2$  just before wing margin in both anterior and posterior wings in both sexes. Mesoscutum with two elongate warts, scutellum with a single median wart.

Spurs 2:4:4.

Only one genus with one species in Tasmania.

The tribe Oeconesini in the family Sericostomatidae was proposed by Tillyard (1921) to include three New Zealand genera—*Oeconesus* McLachlan, *Pseudoeconesus* McLachlan and *Zelandopsyche* Tillyard. Another two genera were added to these by McFarlane (1960). Neboiss (1975) added another genus from Tasmania and demonstrated that this tribe is sufficiently distinct to be regarded as a family. It closely resembles the family Goeridae, but differs from the latter by the wing venation, with  $R_1$  joining  $R_2$  before the wing margin, and one or two-segmented maxillary palpi in male.

### Genus *Tascuna* Neboiss

*Tascuna* Neboiss, 1975:82.

Type species: *Tascuna ignota* Neboiss, 1975.

Anterior wings broad, sparsely covered with stiff, bristle-like hairs; venation aberrant in male, with anal veins completely absent. Posterior wings with broad anal field, discoidal cell

very small. Maxillary palpi in male upturned in front of the face, slightly curved, single segmented. Head dorsally with undivided antero-mesal, a pair of small anterolateral, and larger posterolateral warts. Mesoscutum with two elongate warts, scutellum with one large median, posteriorly pointed wart.

Spurs 2:4:4.

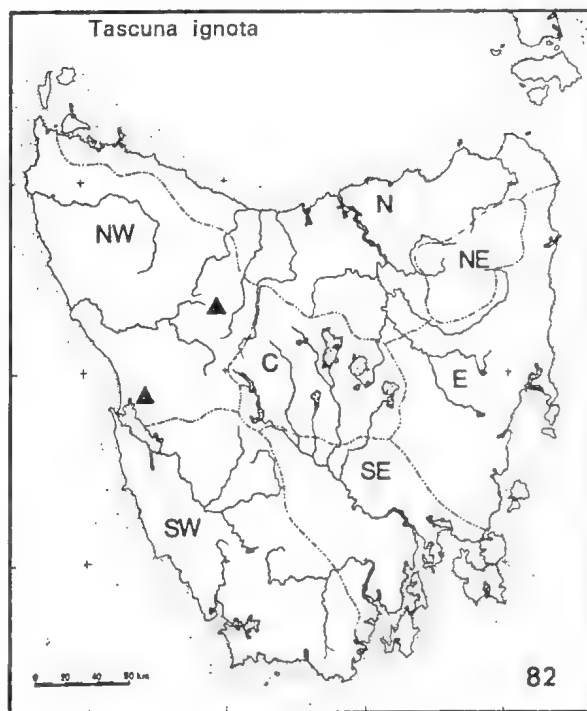
## 82 *Tascuna ignota* Neboiss

Figures 421-425

*Tascuna ignota* Neboiss, 1975:82.

Anterior wings kept flat above the body, yellowish-brown, irregularly mottled, with dark-brown irregular spots, more or less distinct dark-brown transverse band at the apical third; venation aberrant in male with reduction in M-Cu sector and anal veins absent. Posterior wings broad, uniformly yellowish-brown, with the exception of mottling along the costa and wing tip. Antennae slightly longer than the anterior wing.

♂ genitalia with a short, rounded median lobe on dorsal margin of segment 9. Segment 10 long and slender, deeply excised distally. Superior appendages slender, rod-like. Inferior



appendages short, two-segmented; coxopodite semicircular in transversal section, ventrally with acutely produced distal angles, from the upper margin arises a short, rounded median process and a longer lateral process; harpago short, digitiform, the rounded apex dorsally covered with a group of short, strongly chitinized spines. Phallus cylindrical with a pair of distally pointed and divergent parameres.

♀ unknown.

*Length of anterior wing:* ♂ 16–17 mm.

*Type material:* Holotype ♂, 2 ♂ paratypes Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971, A. Neboiss (NMV). 6 ♂ paratypes—10 mls E of Strahan, 20 Feb. 1963, I. F. B. Common and M. S. Upton (ANIC); 1 ♂ paratype same loc. 6 Feb. 1967, E. F. Riek (ANIC). Type seen.

*Distribution:* Tasmania—NW province.

### 13 Family TASIMIIDAE Riek (1968)

Riek (1968) synonymized the genus *Molanniella* Banks (1939) with *Tasimia* Mosely (1936a) and erected a new family to take this endemic Australian genus. The move was based on discovery of the larvae and the analysis of adult characters. It is considered to be closely related to the family Lepidostomatidae of which no Australian species are known. To this family two South American genera have been added.

*Family diagnosis:* Ocelli absent. Eyes covered with short setae; antennae slightly longer than anterior wings, first segment long, thickened, second very short, rounded; maxillary palpi 4-segmented in male, 5-segmented in female; mesoscutum with two rounded warts, separated from the median line; anterior wings with reduced jugal lobe.

Spurs 2:4:4; those of hind tibia situated well beyond middle.

Larvae construct elongate, dome-shaped cases, which resemble those of the family Glososomatidae, apart from the partial apical closure.

Two Australian genera are placed in this family, one of which is here described as new.

#### KEY TO THE GENERA

(Males only)

1. Inferior appendages curved, horn-like,

more or less pointed apically; anterior wings evenly and densely covered with fine hairs . . . . . *Tasimia*

- Inferior appendages very short and broad, in anterior wings main veins covered with scale-like hairs . . . . . *Tasiagma*

#### Genus *Tasimia* Mosely

*Tasimia* Mosely, 1936a:404; Mosely and Kimmins, 1953:121; Riek, 1968:113.

*Molanniella* Banks, 1939: 481; Mosely and Kimmins, 1953:147; Riek, 1968:113.

*Type species:* *Tasimia palpata* Mosely, 1936.

The genus, in addition to the description given in the family diagnosis, is characterized by its wing venation, differing in the sexes. In the male, anterior wing with forks 2 and 5 or 2, 3 and 5 present, fork 2 either sessile or with short footstalk; anal margin rolled over in a long, narrow fold; posterior wing with forks 2 and 5 present, excision in wing margin at the end of  $Cu_2$ ; a row of stiff bristles along the basal half of the costa. In female the anterior and posterior wings with forks 2, 3 and 5 present; no fold along the anal margin of anterior wing, and no incision at the posterior wing margin. Small ventral processes on sternite 6 and 7 in males, on sternite 7 only in females.

All species are moderately small to medium size and their distribution ranges from SE Queensland to Tasmania. The larvae live in fast flowing, clear mountain streams. Riek (1968) gives a key for separating the described species, listing *T. palpata* Mosely as the only Tasmanian species, but he apparently overlooked *T. denticulata*, described by Jacquemart (1965). To these one new species from South West Tasmania is now added, bringing the total number of species known from this region to three, all endemic.

#### KEY FOR SEPARATING TASMANIAN SPECIES

(Males only)

1. Anterior wings with forks 2 and 5 only . . . . . 2
- Anterior wings with forks 2, 3 and 5 . . . . . *drepana*
2. Apex of phallus in dorso-ventral view with broad lateral projections . . . *palpata*
- Apex of phallus in dorso-ventral view with lateral projections short . . . *denticulata*

83 *Tasimia palpata* Mosely

Figures 426-432

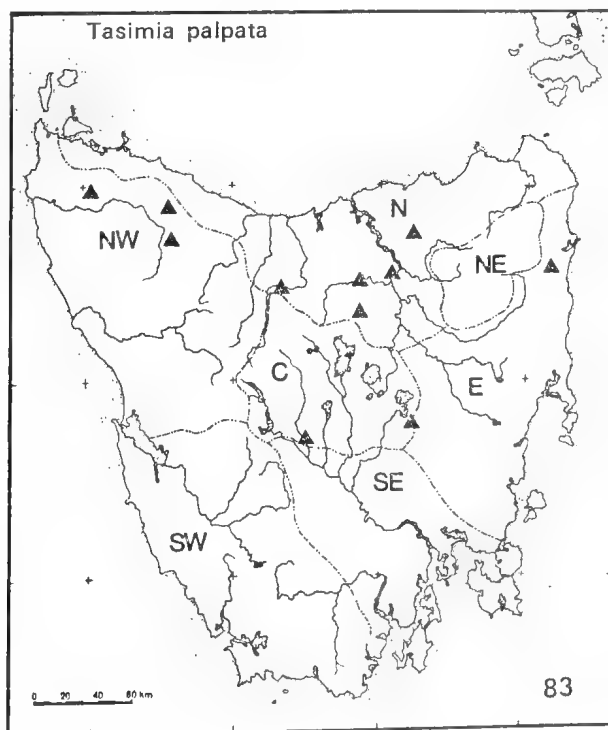
*Tasimia palpata* Mosely, 1936a:405; Mosely and Kimmins, 1953:123; Riek, 1968:113.

Insect of moderately small size, yellowish-brown, anterior wings faintly mottled, in male with forks 2 and 5, in female 2, 3 and 5 present.

♂ genitalia; segment 9 very narrow dorsally, gradually widened ventrally; segment 10 large, hood-like; superior appendages small; inferior appendages distinctly darkened, curved horn-like; phallus short, apex distinctly widened laterally, central lobe smaller than the lateral flanges; a small ventral process on sternite 7, a slightly larger one on sternite 6.

♀ abdomen dorsally terminates in two rounded lobes, divided by narrow excision in the middle; ventrally somewhat flattened, with three-lobed central plate, the base of each lateral lobe with a conspicuous dark pigmented spot.

Length of anterior wing: ♂ 6.5-7.5 mm; ♀ 7.5-8.5 mm.



Type material: Type ♂ ♀ Launceston, Cataract Gorge, Tas., Jan. 1923, C. L. Edwards (BMNH). Type not seen.

Material examined: Tasmania—1 ♂ Scamander River, Upper Scamander, 9 Nov. 1972; 1 ♂ 5 km W of Bronte, small creek, 8 Nov. 1972; 2 ♂ Hellyer River Gorge, 5 Nov. 1972; 1 ♂ same loc., 2 Dec. 1972, P. Zwick; 20 ♂ 7 ♀ same loc., 12 Dec. 1974; 7 ♂ Flowerdale River nr. Meunna, 4 Nov. 1972; 8 ♂ 1 ♀ Duck River 6 km SW of Roger River, 29 Nov. 1974; 2 ♂ 1 ♀ Meander River 3 km N of Westbury, 16 Dec. 1974; 2 ♂ Mersey River tributary 4 km W of Liena, 15 Dec. 1974; 1 ♂ Liffey River 5 km W of Liffey, 2 Dec. 1974; 1 ♂ 1 ♀ Blackman River 15 km NW of Oatlands, 5 Dec. 1974; 1 ♀ Lilydale, creek 2 km N, 16 Dec. 1974. All specimens collected by A. Neboiss unless stated otherwise (NMV).

Distribution: Tasmania—N, NW, C and E provinces.

84 *Tasimia denticulata* Jacquemart

Figures 433-438

*Tasimia denticulata* Jacquemart, 1965b:6; Neboiss, 1974c:14.

Adult specimens of slightly smaller average size, but of similar colouring to that of *T. palpata*. The venation of anterior wing in the male is also similar to that in *T. palpata* with forks 2 and 5 present. The figures 4d and e of original description do not show all cross veins.

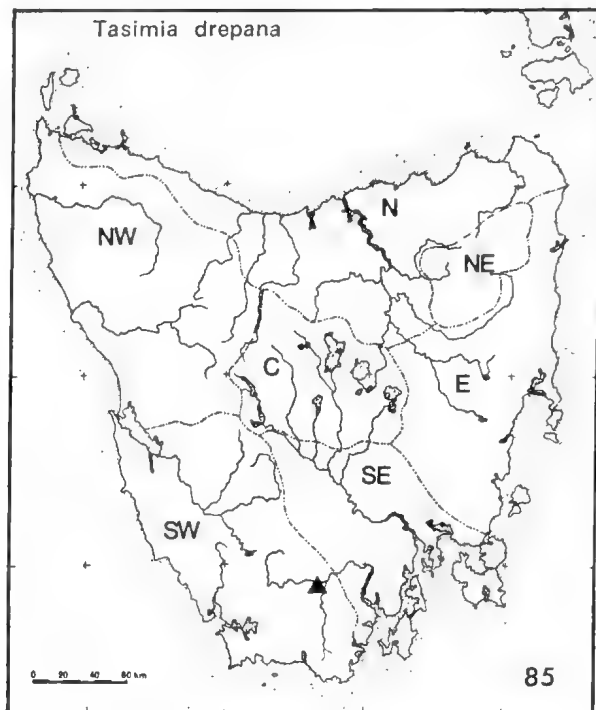
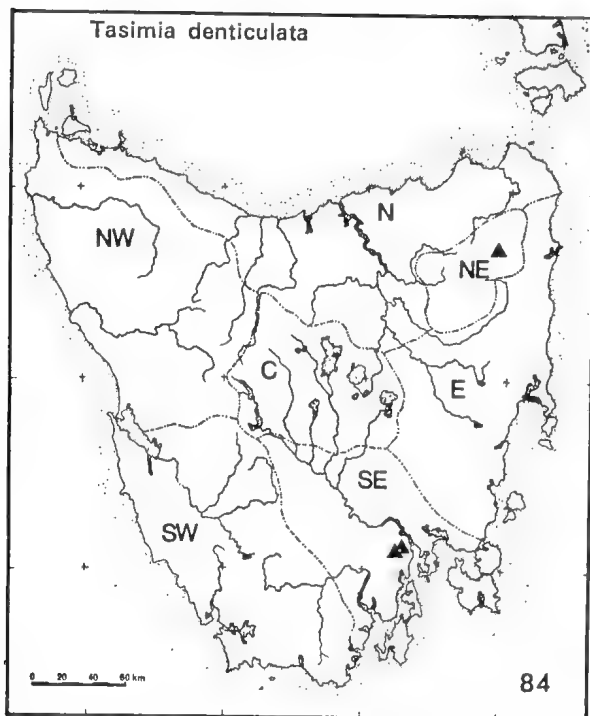
♂ genitalia; segment 9 very narrow dorsally, widened towards the middle; segment 10 hood-like; superior appendages small, apically rounded; inferior appendages curved, horn-like, the inner ventro-basal angle produced to a distinct lobe; phallus short, robust, central lobe larger than the lateral flanges; a small ventral process on sternite 6 and 7.

♀ abdomen dorsally terminates in two rounded lobes, divided in the middle by a wide excision; ventrally somewhat flattened, with three-lobed central plate, similar to that in *T. palpata*, but lacking dark pigmented spot at the base of each of the lateral lobe.

Length of anterior wing: ♂ 6-7 mm; ♀ 7-7.5 mm.

Type material: Holotype ♂ Ada Bay 28.xi.1922, A. Tonnoir (IRScNB), dissected and mounted on three microscope slides. Type seen.

The locality 'Ada Bay' most likely is abbreviation for Adventure Bay, Bruny Island, Tasmania, where Tonnoir had collected a number of other insects between 28 and 30 December, 1922; the month 'xi' (November) is uncertain.



*Material examined:* Tasmania—5 ♂ St. Columba Falls, Pyengana, 21 Feb. 1971; 21 ♂ 8 ♀ Strickland Ave., Hobart, 8 Dec. 1974; 1 ♀ Mt Wellington, 8 Dec. 1974. All specimens collected by A. Neboiss (NMV).

*Distribution:* Tasmania—NE and SE provinces.

#### 85 *Tasimia drepana* sp. n.

Figures 439-443

Anterior wings yellowish-brown, faintly mottled, in male with forks 2, 3 and 5 present; a narrow, rolled-over fold along the anal margin.

This species is very close to *denticulata*, but differs from it by the presence of fork 3 in the male anterior wing and the shape of phallus.

♂ genitalia very similar to that of *denticulata*, but inferior appendages slightly less curved and the phallus without the extended central lobe.

♀ unknown.

*Length of anterior wing:* ♂ 6 mm.

*Type material:* Holotype ♂ (T5170), 1 ♂ paratype (T5171) Huon River 2 km W of Huon-Picton River junction, Tas., 11 Feb. 1966, A. Neboiss (NMV).

*Distribution:* Tasmania—SW province (known from the type locality only).

#### Genus *Tasiagma* gen. n.

*Type species:* *Tasiagma ciliata* gen. et sp. n.

The wing venation basically is the same as in *Tasimia*, but in the male anterior wing fork 2 is with a short footstalk, fork 3 present and  $Cu_{1b}$  joins  $Cu_2$  very close to the wing margin; the main veins covered with scale-like hair; posterior wing with forks 2 and 5 present. Antennae about as long as the anterior wing, first segment long, thickened, second segment very short, rounded, the following ones elongate, slender. Maxillary palpi in male 4-segmented, held upwards in front of the face, segment 3 the longest, slightly curved; terminal segment short. In female 5-segmented, segment 1 short. Eyes covered with short setae.

#### 86 *Tasiagma ciliata* sp. n.

Figures 444-450

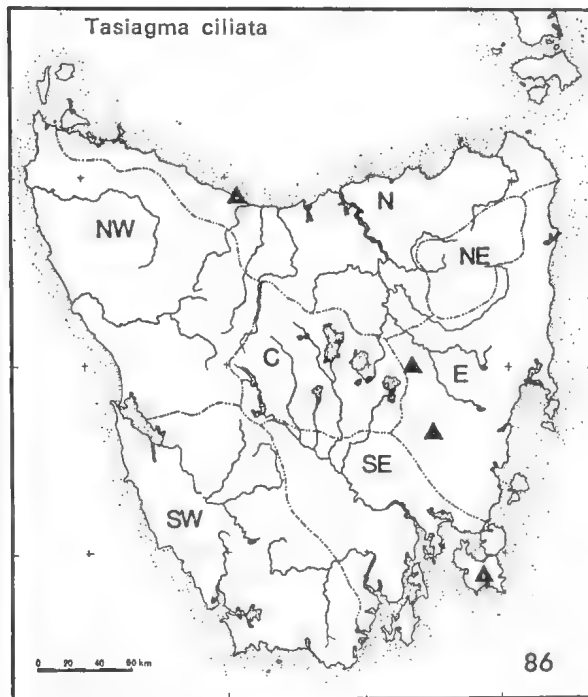
Insect very pale-yellowish. Characters other than genitalia as given in the generic description.

♂ genitalia; segment 9 narrow, ventrally produced to a broad, triangular plate, curved and roundly excised apically; segment 10 short,

broad, apically truncate; superior appendages short, lying close to segment 9; inferior appendages broadly oval, curved, with groups of setae on inner surface; phallus downturned, triangular. Small processes on sternite 6 and 7.

♀ abdomen dorsally terminates with hood-shaped plate, broadly cleft apically; ventral plate with a pair of central lobes, lateral margins ridged.

Length of anterior wing: ♂ 7-7.5 mm; ♀ 7.5-8 mm.



**Type material:** Holotype ♂ (T5172), allotype ♀ (T5173), 20 ♂ 10 ♀ paratypes (T5174-T5203) Andover, York Rivulet, Tas., 4 Dec. 1974, A. Neboiss; 1 ♂ paratype (T5204) Port Arthur, Tas., 15 Feb. 1971, A. Neboiss (NMV).

**Other material examined:** Tasmania—1 ♂ Ulverstone 4 km NM, coastal waterfalls, 18 Nov. 1972; 1 ♂ Isis River nr. Auburn, 4 Dec. 1974; Victoria—1 ♂ Gibbo River-Morass Creek junction, 1 Feb. 1974; New South Wales—1 ♂ Minnamurra Falls nr. Kiama, 25 Mar. 1973. All specimens collected by A. Neboiss (NMV).

**Distribution:** Tasmania—N, E and SE provinces; Victoria; New South Wales.

#### 14 Family HELICOPSYCHIDAE Ulmer (1906)

**Family diagnosis:** Ocelli absent. Head dorsally with a pair of large, densely hairy warts. Maxillary palpi 2-segmented in males\*, 5-segmented in females, segment 1 long. Mesoscutum with a pair of rounded warts; scutellum rounded anteriorly with a pair of somewhat oval warts. Posterior wings with well developed hamuli on basal half of anterior margin.

Spurs 1:2:2; 2:2:2 or 2:2:4.

The family has a world-wide distribution, but is most diverse in tropical countries. The genus *Helicopsyche* is so far the only one recognized from Australia and Tasmania.

The larvae build very distinctive snail-like cases of small sand grains, and are found attached to larger stones in flowing water, usually in clear mountain streams. First Tasmanian record of larvae was made by Dyer (1879).

\* Some family descriptions give male maxillary palpi as being 3-segmented.

#### Genus *Helicopsyche* Siebold

*Helicopsyche* Siebold, 1856:38; McLachlan, 1880:58; Tillyard, 1924:312; Mosely and Kimmins, 1953:65; Flint, 1964:69.

**Type species:** *Helicopsyche shuttleworthi* Siebold, 1856.

Antennae about as long as the anterior wings, segment 1 very long, longer than head; gradually dilated at apex. Head dorsally with a pair of large, slightly curved warts, almost touching posteriorly. Maxillary palpi 2-segmented in males. Anterior wings densely pubescent, discoidal and thyridial cells both present, the latter very long. Posterior wings also densely pubescent, discoidal cell absent.

Spurs 2:2:4. The external spur on anterior tibia reduced; the subapical pair on the posterior tibia not far from the apical pair. Mid-tibia with a row of small spines.

#### KEY FOR SEPARATING TASMANIAN SPECIES

(Males only)

1. Frons and first segment of maxillary palpi covered with fine, long hairs; posterior wing with longitudinal fold along anal margin . . . . . *bartona*

- . Frons and upper surface of first segment of maxillary palpi with broad, scale-like androconia; posterior wing without fold . . . . . *murrumba*

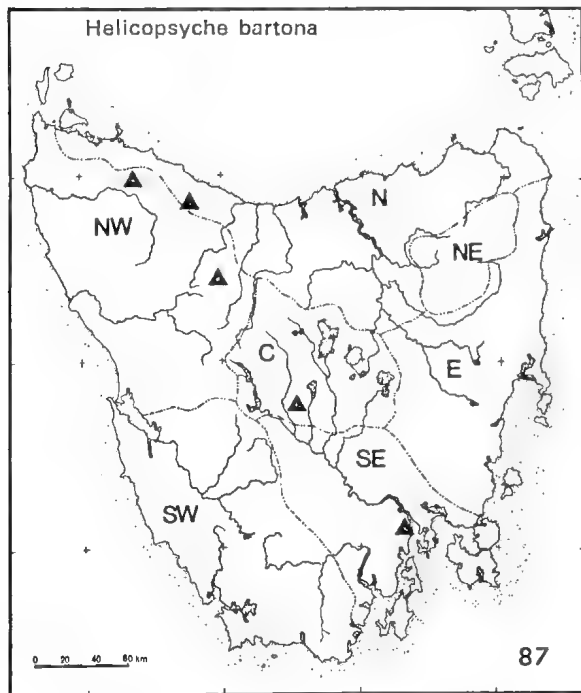
### 87 *Helicopsyche bartona* Mosely

Figures 451-455

*Helicopsyche bartona* Mosely in Mosely and Kimmins, 1953:71.

Abdominal sternite 3 to 5 strongly reticulated, the following ones with paler reticulation. Anterior wings normal; cross-veins above discoidal cell not always present, only one anal vein present. Posterior wings with deep longitudinal fold from the base along the anal margin as far as the anostomosis.

♂ genitalia with segment 10 elongate, distally slightly tapering, and with a somewhat oval, apical incision; a pair of dorsal processes arise at approximately the middle of the segment and bear several upwardly and outwardly-directed, strong spines. Superior appendages small, directed outward. Phallus curved, apex slightly dilated. Inferior appendages narrow at base, apically widened and divided into two lobes, curved inward; a pair of small, apically clubbed processes arise from the base and are visible in ventral view.



♀ unknown.

Length of anterior wing: ♂ 5-6 mm.

Type material: Type ♂ Hobart, Tas., Dec. 1937, J. W. Evans (BMNH). Type not seen.

Material examined: Tasmania—1 ♂ Strickland Avenue, Hobart, 5 Dec. 1974; 2 ♂ Nive River 2 km W of Bronte, 5 Dec. 1974; 1 ♂ Iris River tributary 15 km W of Cradle Mtn, 13 Dec. 1974; 2 ♂ Dip River Falls, 1 Dec. 1974; 1 ♂ Guide River Falls, Ridgley, 18 Nov. 1972. All specimens collected by A. Neboiss (NMV).

Distribution: Tasmania—SE, C, NW and N provinces.

### 88 *Helicopsyche murrumba* Mosely

Figures 456-460

*Helicopsyche murrumba* Mosely in Mosely and Kimmins, 1953:72.

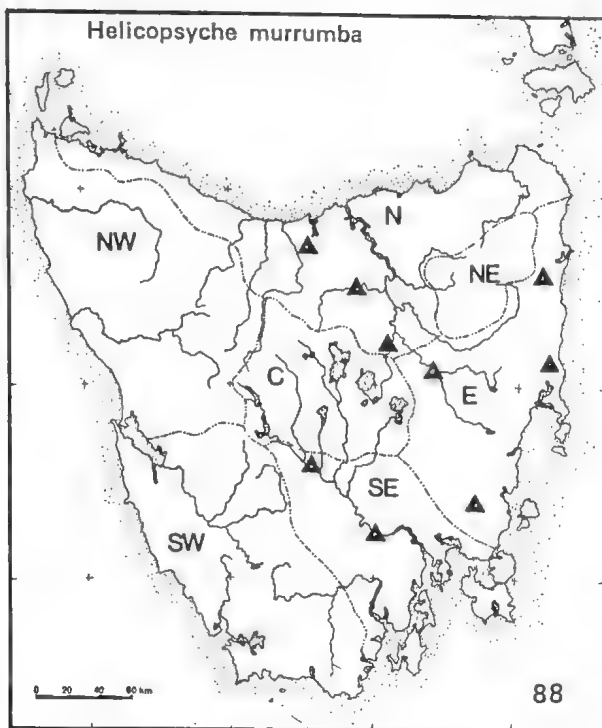
In both sexes abdominal sternite 3, 4 and often also 5 strongly reticulated, the following sternites with pale reticulation; ventral process on sternite 6 stout, apically truncate. Anterior wing in male with a fold near the base in position of the first anal vein. The first segment of the male maxillary palpi dorsally with longitudinal excavation which is covered with broad androconia; similar androconia also on the frons and the mesal surface of the first antennal segment.

♂ genitalia with segment 10 rather narrow, deeply cleft, a strong dorsal bristle on either side of cleft near apex; close to the base a narrow central ridge and on either side a distally directed process. Superior appendages small. Phallus membranous, forked distally, apices curved upward and directed either posteriorly or more or less laterally. Inferior appendages with narrow base, widened to a broadly triangular, incurved plate; a pair of small clubbed processes ventrally.

♀ abdomen with tergite 9 formed by two triangular, distally pointed plates, the apices pigmented dark and curved downward; separated dorsally by a broad, mesal incision.

Length of anterior wing: ♂ 5-6 mm; ♀ 6-7 mm.

Type material: Type ♂ Murrumbidgee River, F.C.T., Jan. 1933, R. J. Tillyard; 3 ♂ paratypes Mt Kosciuszko, N.S.W. 2700 ft., 20 Jan. 1889, McLachlan Collection (BMNH). Type not seen.



**Material examined:** 151 ♂ 277 ♀ Scamander River, Upper Scamander, 9 Nov. 1972; 3 ♂ Macquarie River nr. Campbell Town, 9 Nov. 1972; 8 ♂ 3 ♀ Apsley River, Bicheno, 9 Nov. 1972; 1 ♂ 1 ♀ Lake River nr. Delmont, 9 Nov. 1972; 44 ♂ 70 ♀ Meander River 3 km N of Westbury, 16 Dec. 1974; 24 ♂ 19 ♀ Rubicon River 8 km SE of Sassafras, 2 Dec. 1974; 1 ♂ Black Bobs Creek 15 km NW of Ouse, 9 Dec. 1974; 2 ♂ Derwent River 3 km W of New Norfolk, 7 Dec. 1974; 2 ♂ Prosser River 2 km W of Buckland, 7 Dec. 1974. All specimens collected by A. Neboiss (NMV).

**Distribution:** Tasmania—E, N and SE provinces. New South Wales.

### 15 Family CALOCIDAE Ross (1967)

The family was erected by Ross (1967) without giving specific family diagnosis, nor stating the included genera; it was only said that it 'appears to be little changed from Ancestor 15' in which 'the spur count dropped to 2:2:4'. It is reasonable to assume that the family is based on the genus *Caloca*, originally described by Mosely (1953) in the family Odontoceridae. This genus should thus be regarded as the type genus.

Structures indicating relationship to the genus *Caloca* are also found in several sericostomatid genera, which now are included in the family

Calocidae and discussed in the following paragraphs.

The re-examination of the type and paratypes of *Tismiana saneva* Mosely revealed that the two terminal segments of the maxillary palpi had been broken off in the type, thus resulting in erroneous diagnosis. The head dorsally has expandable filaments, which, together with the wing venation, places the genus *Tismiana* into synonymy with *Caloca*, but the species *saneva* remains valid.

Genus *Caenota*, although having 3-segmented maxillary palpi in the male, has basically similar wing venation (particularly the Sc-R<sub>1</sub> area in the posterior wings), similarly situated hyaline areas in the anterior wings and the combination of head and scutal warts. The folded anal margin in the male posterior wings apparently occupies an intermediate position between the normally shaped male posterior wings in *Caloca* and the strongly folded ones in *Tamasia*.

The analysis of characters in the genus *Tamasia*, indicated that some other structures are also very similar to those found in *Caloca*, particularly the head and scutal warts, but the sinuate anterior tentorial arms and the modified maxillary palpi in male resemble the New Zealand genus *Pycnocentrella* Mosely. Based on this genus, Ross (1967) erected family Pycnocentrellidae which he considered to be one of the four families arising from his suggested 'Ancestor 15'. No other details of the family diagnosis were given except that 'the anterior tentorial arms are sinuate and spreading anteriorly'.

From this evidence it appears that the two Australian genera *Caenota* and *Tamasia* are situated between *Caloca* and *Pycnocentrella*. The head and thorax of the New Zealand species *Pycnocentrella eruensis* Mosely is illustrated (Figures 480-483) to show the similarity with *Tamasia variegata*. The differences are considered insufficient to warrant separation at the family level and therefore the family Pycnocentrellidae Ross (1967) is placed into synonymy with Calocidae Ross (1967).

**Family diagnosis:** Ocelli absent. Antennae moderately stout, shorter than the anterior



wings; basal segment long, stout, in males usually bearing one or two expanded projections or lobes and are covered with specialized hairs; second segment very short. Maxillary palpi 3 to 5-segmented in males; modifications in the shape of segments occur in palpi with reduced number of segments; in females maxillary palpi 5-segmented, normal. Labial palpi slender, 3-segmented. Head in males with long postocular warts only, dorsally in the centre with expandable filaments or various membranous projections; in females the postocular warts usually are shorter, large posterolateral warts present. Pronotum with a pair of small median and larger lateral warts, except in the males of genus *Caenota* which have only one pair of elongate warts.

Anterior wings with discoidal cell present, rather small; long, narrow hyaline line along M and a small hyaline area enclosing crossvein r-m; three anal veins, A<sub>1</sub> joining Cu<sub>2</sub> near arculus. Wing venation differing in sexes.

Spurs 2:2:4. Mid-tibia and tarsi with small spines.

#### KEY TO TASMANIAN GENERA

1. In posterior wing R<sub>1</sub> merges with Sc for a short distance distad of discoidal cell . . . . . 2
- In posterior wing Sc connected with R by a short cross-vein . . . . . *Tamasia*
2. Warts on scutellum narrow, separated by space approximately equal to their own width; males with 5-segmented maxillary palpi . . . . . *Caloca*
- Warts on scutellum broad, separated by space less than half their own width; males with 3-segmented maxillary palpi . . . . . *Caenota*

#### Genus *Caloca* Mosely

*Caloca* Mosely in Mosely and Kimmins, 1953:153.

*Tismana* Mosely in Mosely and Kimmins, 1953:65.  
**syn. nov.**

**Type species:** *Caloca straminea* Mosely, 1953.

The genus was placed in the family Odontoceridae, although it did not agree with several of the family characteristics. The genus *Tismana* was found to be synonymous for the reasons explained above in the discussion of the family.

Antennae slightly shorter than anterior wings, segment 1 long, stout, in males often with a lateral branch, densely covered with long hairs; segment 2 very short. Maxillary palpi 5-segmented in both sexes, segment 2 to 4 approximately equal in length, segments 1 and 5 slightly shorter. Labial palpi with segment 1 short, segments 2 and 3 each about twice the length of the first. Head dorsally with large posterolateral warts in females, which in the male are replaced by a triangular receptacle for retractable membranous filaments. Postocular warts much shorter in female than in male, where they are long, narrow and extend dorsally to about the middle of the head. Anterior wings with discoidal and thyridial cell present.

Three species have been recorded from Tasmania.

#### KEY TO TASMANIAN SPECIES

(Males only)

1. Inferior appendage with inturned lateral branch . . . . . *tertia*
- Inferior appendage without lateral branch . . . . . 2
2. Segment 10 with deep and broad median incision . . . . . *saneva*
- Segment 10 very broad, median incision narrow . . . . . *ascita*

#### 89 *Caloca tertia* Mosely

*Caloca tertia* Mosely in Mosely and Kimmins, 1953: 156.

♂ genitalia with segment 10 longer than wide, with small V-shaped median incision at apex and a number of strong, posteriorly directed spines. Phallus with sagittate apex. Inferior appendages with incurved lateral branch. Wing venation and male genitalia have been figured in the original description.

♀ unknown.

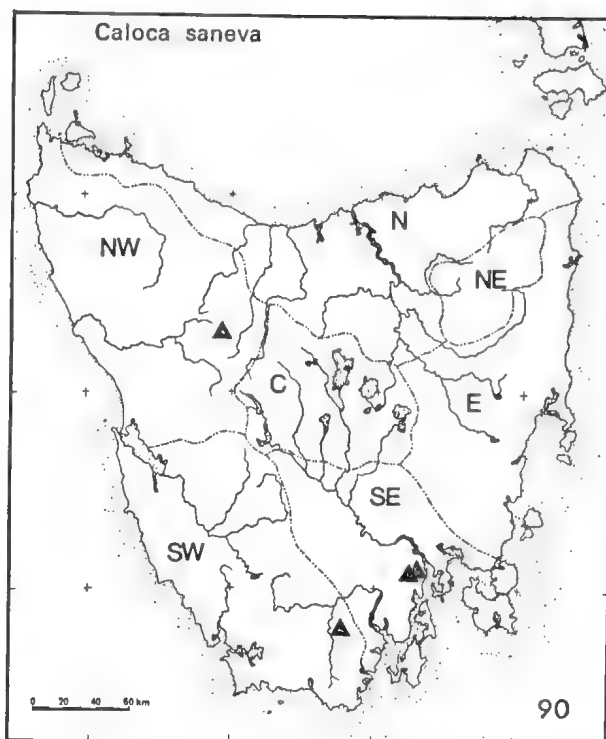
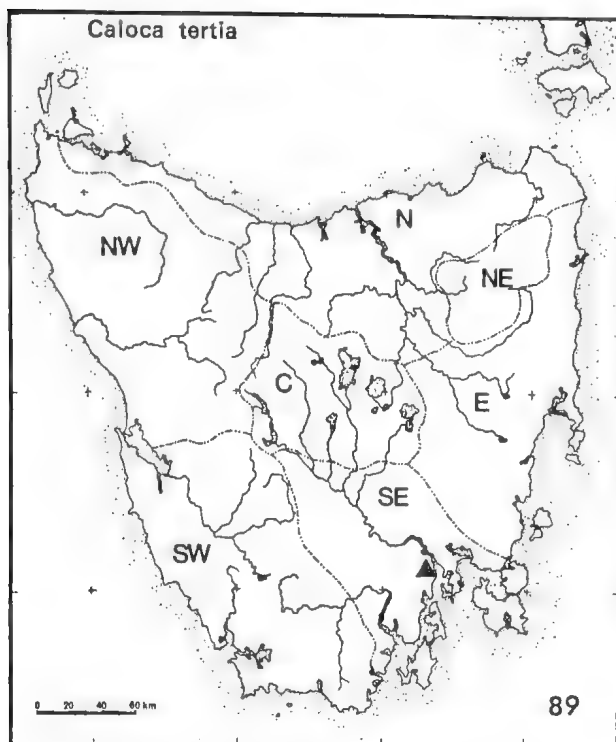
**Length of anterior wing:** ♂ 8 mm.

**Type material:** Type ♂ Mt Wellington, Tas., Dec. 1937, J. W. Evans (BMNH). Type not seen.

No new material has been available for study.

**Distribution:** Tasmania—SE province.





90 *Caloca saneva* (Mosely) comb. n.

Figure 461

*Tismana saneva* Mosely in Mosely and Kimmins, 1953:65; Jacquemart, 1965b:3.

Maxillary palpi 5-segmented, the two apical segments more slender than the basal ones. The first antennal segment without lateral branch.

♂ genitalia with lateral margins of segment 9 produced posteriorly into broad, triangular lobe. Segment 10 longer than wide, with few stout, anteriorly directed spines near apex, broad elongate oval apical incision in the middle. Superior appendages slender, extending posteriorly as far as the apices of the inferior appendages, slightly constricted near the base. Phallus curved downwards, apex compressed laterally. Inferior appendages long, stout, lateral margins curved upwards, apices acute, slightly bent inwards.

♀ unknown.

Length of anterior wing: ♂ 7-7.5 mm.

Type material: Type ♂ Tasmania, J. W. Evans, without definite locality and date; specimen dissected and mounted on microscope slide. 2 ♂ paratypes Hobart, Oct. 1936, J. W. Evans (BMNH). Type seen.

Material examined: 1 ♂ Dove River, Cradle Mtn., Nat. Park, 14 Dec. 1974, A. Neboiss (NMV).

Other recorded localities: Mt Wellington; Hartz Mtn. (Jacquemart, 1965b).

Distribution: Tasmania—SE, SW and NW provinces.

91 *Caloca ascita* sp. n.

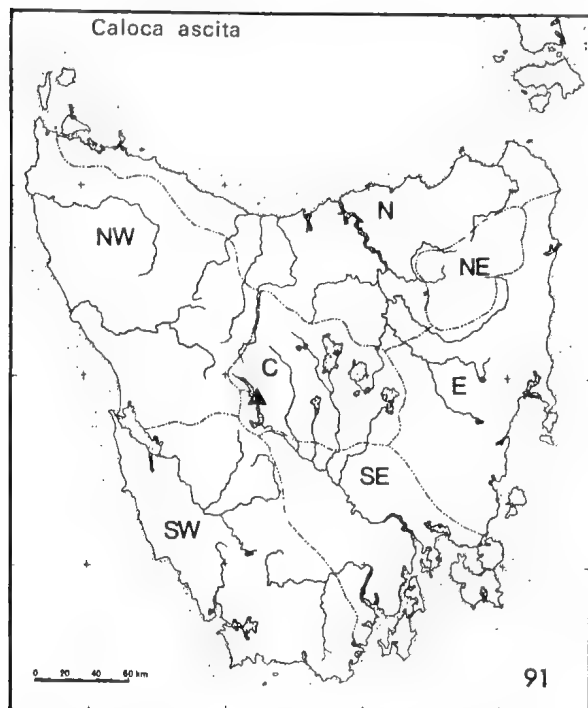
Figures 462-467

This species is distinguished from the others by the characteristic male genitalia. The first antennal segment without lateral branch.

♂ genitalia with lateral margins of segment 9 produced into broad, triangular lobes. Segment 10 about as wide as long, with deep, narrow median incision; the inner lower margins produced downwards with one strong spine each; another strong spine on each apical angle. Superior appendages slender, extending posteriorly about as far as the apex of segment 10. Phallus curved downwards, truncate in lateral view. Inferior appendages long, stout, wider at the base, extending well beyond the apex of segment 10.

♀ unknown.

Length of anterior wing: ♂ 6.5 mm.



*Type material:* Holotype ♂ (T5207) Lake St. Clair, 14 Feb. 1956, E. T. Smith (NMV).

*Distribution:* Tasmania—C province.

#### Genus *Caenota* Mosely

*Caenota* Mosely in Mosely and Kimmins, 1953:61  
*Type species:* *Caenota plicata* Mosely, 1953.

The first antennal segment normal in females, but in males with large protuberances at the back, lined with androconia and a small branch in front. Head in females with a pair of anterior warts close to the base of antennae, posterolateral warts large, postocular warts normal; in male the postocular warts extended dorsally, but anterior and posterolateral warts absent, replaced by other structures. Pronotum with two pairs of warts in female, but only one pair of elongate ones in male. Mesoscutum without warts, scutellum with a pair of large warts, separated in the middle by a narrow space.

Maxillary palpi 3-segmented and irregularly shaped in male; normal, 5-segmented in female. Mid-tibia and tarsi with spines.

Wing venation normal in anterior wings of both sexes, with scales along the major longitudinal veins in the males; the anal margin of the posterior wings in males folded and covered with scales.

Only one species in Tasmania.

#### 92 *Caenota plicata* Mosely

Figures 468-479

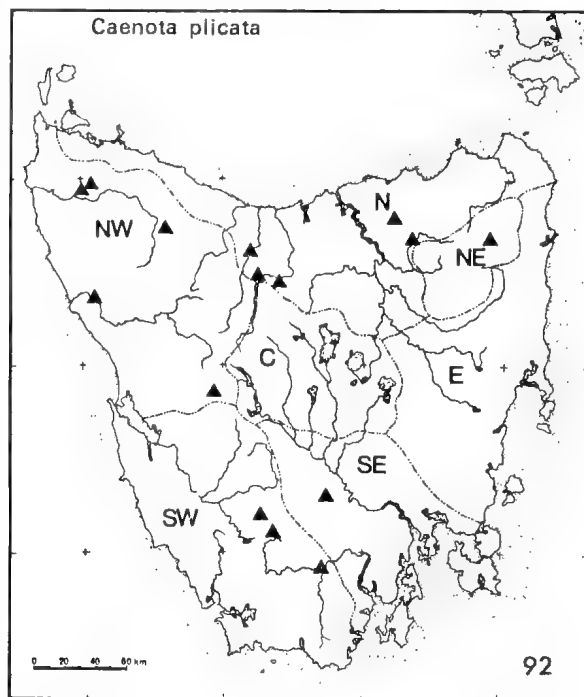
*Caenota plicata* Mosely in Mosely and Kimmins, 1953:61.

Antennae in male with large, flattened lobe at the back, and a small, membraneous branch in front of the segment 1; in female this segment is not modified. Maxillary palpi 5-segmented, normal in female; 3-segmented, modified irregular, apically with brush of long hairs in male.

♂ genitalia with segment 9 narrow dorsally. Segment 10 longer than wide, tapering distally, apex with small mesal incision. Superior appendages rather small, finger-like. Inferior appendages broad at base, two branched; upper branch laterally slightly flattened, lower branch twisted apically.

♀ abdomen terminates with dorsal median plate, with wide V-shaped apical incision; on either side of the plate there is a finger-like process, and below that a pair of broad, apically truncate plates.

*Length of anterior wing:* ♂ 11-13 mm; ♀ 12-14 mm.



**Type material:** Type ♂ Diggers Creek, Mt Kosciusko area, N.S.W., 29-30 Jan. 1930, R. J. Tillyard (BMNH). Type not seen.

**Material examined:** Tasmania—7 ♂ 8 ♀ Corinna, 5 Nov. 1972; 10 ♂ 10 ♀ St Columba Falls, Pyengana, 21 Feb. 1971; 2 ♂ Wedge River, 17 Feb. 1971; 1 ♂ Russell Falls, Nat. Park, 5 Dec. 1972, P. Zwick; 2 ♂ Mersey River, Liena, 16 Nov. 1972; 2 ♀ Huon-Picton River junction, 18 Feb. 1967; 1 ♂ 6 ♀ Huon River crossing, 16 Feb. 1971; 1 ♀ Hellyer River Gorge, 9 Feb. 1971; 2 ♂ 1 ♀ same loc., 12 Dec. 1974; 1 ♀ St. Patricks River, Targa, 22 Feb. 1971; 4 ♀ Marakoopa Caves, 15 Dec. 1974; 1 ♂ Eckberg Creek, 12 km SW of Roger River, 29 Nov. 1974; 2 ♂ 2 ♀ Lilydale, a creek 2 km N, 16 Dec. 1974; 6 ♂ 11 ♀ Duck River 6 km SW Roger River, 29 Nov. 1974. All specimens collected by A. Neboiss unless stated otherwise (NMV).

1 ♀ Forth Falls, 28 Jan. 1967, E. F. Riek (ANIC); 1 ♂ 1 ♀ Franklin River, 10 Feb. 1967, E. F. Riek (ANIC); 1 ♂ 1 ♀ Huon-Picton River junction, 17 Feb. 1967, E. F. Riek (ANIC).

Victoria—1 ♂ Chinaman's Creek, Wilson's Prom., 20 Nov. 1964, N. Dobrotworsky (NMV); 1 ♂ 1 ♀ Cement Creek, Warburton, 8 Dec. 1970, A. Neboiss (NMV); 13 ♂ 11 ♀ Toorongo Falls NE of Noojee, 17 Dec. 1970, A. Neboiss (NMV); 1 ♂ 2 ♀ Timbertop nr. Merrijig, 30 Nov. 1957, J. Landy (NMV); 2 ♂ 6 ♀ 3 km W of Beenak, 7 Jan. 1972, A. Neboiss (NMV).

**Distribution:** Tasmania—NW, SW, SE and N provinces; Victoria; New South Wales.

### Genus *Tamasia* Mosely

*Tamasia* Mosely, 1936a:399; Mosely and Kimmins, 1953:56.

**Type species:** *Tamasia variegata* Mosely, 1936.

Head of females with a pair of raised, anterior warts, a pair of rounded, posterolateral warts and long, narrow postocular warts; in males only, long and narrow postocular warts present. Maxillary palpi 4-segmented in males, segments short, irregular; 5-segmented, normal in females. Antennae almost as long as anterior wings in males, shorter in females; segment 1 long, simple in females, but provided with basal branch in males. Pronotum with a pair of small, rounded median and larger lateral warts; no warts present on mesoscutum, but a pair of elongate ones on scutellum.

Anterior wings with discoidal and thyridial cells present; the narrow hyaline line above M widened at about the middle of thyridial cell. Posterior wings differing in sexes, anal margin longitudinally folded in males, normal in females; discoidal cell absent; basal half

of costal margin covered with a row of stiff, long bristles.

Spurs 2:2:4. Mid-tibia and tarsi with short spines.

### 93 *Tamasia variegata* Mosely

Figures 484-492

*Tamasia variegata* Mosely, 1936a:401; Mosely and Kimmins, 1953:57; Jacquemart, 1965b:5.

This blackish species is widely distributed throughout the state, except for SW province, from which so far there are no records. It is described in detail by Mosely and Kimmins (1953), and can be easily identified by the black anterior wings, marked with irregular, yellowish or pale golden spots.

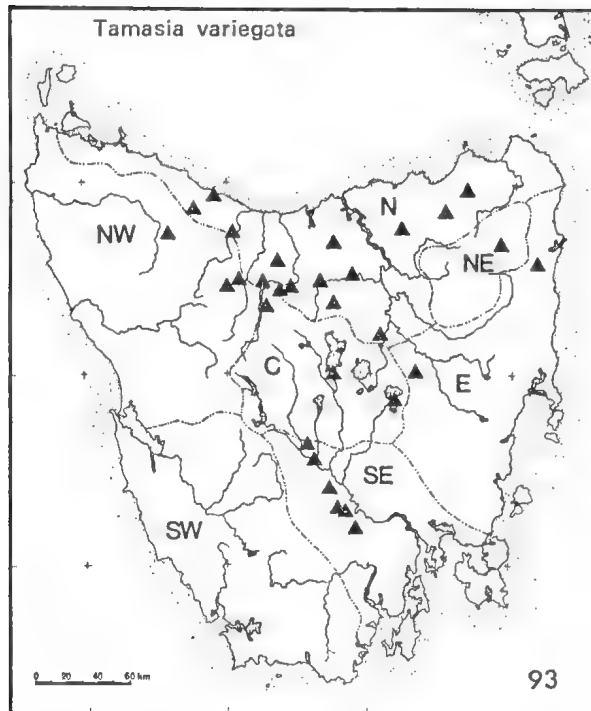
♂ genitalia with tergites 9 and 10 fused, the latter apparently forming the triangular lateral lobes near the apex. Superior appendages robust, curved, laterally slightly compressed. Phallus curved downward, apex tapered with group of basally directed spines on ventral surface. Inferior appendages broad, truncate apically, outer angles produced and turned inwards.

♀ abdomen terminates bluntly, dorsally with a pair of rounded, downturned plates, separated by a small, median excision; sternite 9 flattened.

**Length of anterior wing:** ♂ 6.5-8 mm; ♀ 7.5-9 mm.

**Type material.** Type ♂ Miena, Great Lake, Dec. 1930, C. Parker (BMNH). Type not seen.

**Material examined:** Tasmania—1 ♂ 2 ♀ Scamander River, Upper Scamander, 9 Nov. 1972; 39 ♂ 23 ♀ Grt Forester River 5 km NW Forester, 11 Nov. 1972; 16 ♂ 7 ♀ Leven River nr. Heka, 17 Nov. 1972; 11 ♂ 2 ♀ Mersey River, Liena, 16 Nov. 1972; 6 ♂ Sassafras Creek nr. Mole Creek, 17 Nov. 1972; 1 ♂ 2 ♀ same loc., 8 Dec. 1972, P. Zwick; 6 ♂ 1 ♀ Franklin River nr. Frankford, 19 Nov. 1972; 3 ♂ Ellendale, 4 Dec. 1972, P. Zwick; 2 ♂ Lake River 5 km SW Delmont, 9 Nov. 1972; 1 ♂ Tyenna River, National Park, 15 Nov. 1972; 3 ♂ 1 ♀ Minnow River, Paradise, 17 Nov. 1972; 2 ♂ Guide River Falls nr. Ridgley, 18 Nov. 1972; 2 ♂ Styx River, Westerway, 23 Nov. 1972, J. Blyth; 20 ♂ 7 ♀ Iris River tributary 15 km N of Cradle Mtn., 13 Dec. 1974; 35 ♂ 4 ♀ Bull Creek, Cradle Mtn. Road, 13 Dec. 1974; 2 ♂ 1 ♀ Lilydale, creek 2 km N, 16 Dec. 1974; 2 ♂ Interlaken, Lake Sorell, 5 Dec. 1974; 1 ♂ Meander River 3 km N Westbury, 16 Dec. 1974; 2 ♂ Meander River, De-loraine, 28 Nov. 1974; 39 ♂ 3 ♀ Isis River nr. Auburn, 4 Dec. 1974; 1 ♂ Dee River 8 km NW of Ouse, 9 Dec. 1974; 4 ♂ 1 ♀ Black Bobs Creek 15 km NW



of Ouse, 9 Dec. 1974; 2 ♂ Quamby Brook 1 km E of Golden Valley, 16 Dec. 1974; 1 ♂ Plenty River 6 km E of Moogara, 7 Dec. 1974; 2 ♀ Hellyer River Gorge, 12 Dec. 1974; 1 ♀ nr. Marakoopa Caves, 15 Dec. 1974; 1 ♀ Snake Creek, Fisher River Road, 15 Dec. 1974; 1 ♀ St. Columba Falls, Pyengana, 21 Feb. 1971. All specimens collected by A. Neboiss unless stated otherwise (NMV).

3 ♀ Weaning Paddock Creek 2250 ft, Cradle Mtn., 29 Jan. 1967, E. F. Riek (ANIC).

Victoria—1 ♂ Licola, 14 Nov. 1966, A. Neboiss (NMV); 1 ♂ German creek near Bright, 23 Nov. 1972, P. Zwick (NMV).

**Other recorded localities:** Tasmania—Scottsdale, Burnie. New South Wales—Bathurst.

**Distribution:** Tasmania—all provinces except SW; Victoria; New South Wales.

## 16 Family HELICOPHIDAE Mosely (1953)

**Family diagnosis:** Ocelli absent. Antennae about the same length or slightly shorter than anterior wings, first segment long, stout; second segment short, the following ones elongate. Maxillary palpi slender, 5-segmented in both sexes, length of segments not differing greatly. Head dorsally with large posterolateral warts. Wing venation differing in sexes; anterior wings with discoidal cell either small or entirely absent; a small hyaline area at anastomosis just

below discoidal cell (where present); posterior wings with hamuli or sparsely placed macrotrichia along the basal half of costal margin. Pronotum with one pair of elongate median warts only. Mesoscutum without warts, scutellum with a pair of small warts within unpigmented area.

Spurs 2:2:4. Mid-tibia with row of short spines.

The genus *Alloecella* was originally described by Banks (1939) in the family Molanidae and later transferred to the family Beraeidae by Mosely and Kimmins (1953). In a paper on the females of the British species of Beraeidae Kimmins (1951) discussed the position of scutal warts and their value as diagnostic characters. Comparison with the Australian genus *Alloecella* revealed that the shape of sclerites and the position of warts is entirely different. In *Alloecella* there are no warts on the mesoscutum and the shape of the scutellum is proportionally shorter and somewhat more angular. These structures agree closely with those in the family Helicophidae; also shared are the similar position of a small hyaline area in the anterior wings and the position of warts on the head and pronotum. Based on these similarities the genus *Alloecella* is transferred from Beraeidae to Helicophidae.

The family now has two genera in Australia and Tasmania and one in New Zealand.

### KEY TO TASMANIAN GENERA

1. Anterior wing with discoidal cell closed . . . . . *Helicoph*
- Anterior wing with discoidal cell open . . . . . *Alloecella*

### Genus *Helicoph* Mosely

*Helicoph* Mosely in Mosely and Kimmins, 1953:148.

**Type species:** *Helicoph astia* Mosely, 1953.

Head dorsally with large posterolateral warts extending anteriorly almost to the base of antennae; a pair of small, rounded anterior warts within a triangular area between the base of antennae.

Anterior wings with small discoidal cell; hamuli along basal half of costal margin of the posterior wing, the distal ones more closely together. Median vein incomplete basally in both

wings and both sexes, thus creating large, vein-free areas, particularly noticeable in the posterior wings.

Two species in Tasmania.

KEY FOR SEPARATING  
TASMANIAN SPECIES  
(Males only)

1. Segment 10 triangular, with stout ventro-lateral process . . . . . *astia*
- Segment 10 parallel-sided, broad distally with small median cleft, without ventro-lateral process . . . . . *delamarei*

94 *Helicopha astia* Mosely

Figures 493-495

*Helicopha astia* Mosely in Mosely and Kimmins, 1953:149.

*Helicopha marlieri* Jacquemart, 1965b:17 *syn. nov.*

♂ genitalia with segment 10 somewhat triangular, distally obtuse, bearing a few stiff bristles at the apex, ventrolaterally extended to stout processes with apices turned outward at a more or less sharp angle and armed with several peg-like spines. Superior appendages small. Inferior appendages single segmented, directed upward; about midway, bent and directed distally, apices slightly widened; a strong, curved, apically tapered branch arises from the inner basal half, and a pair of small, inwardly directed projections at about the middle.

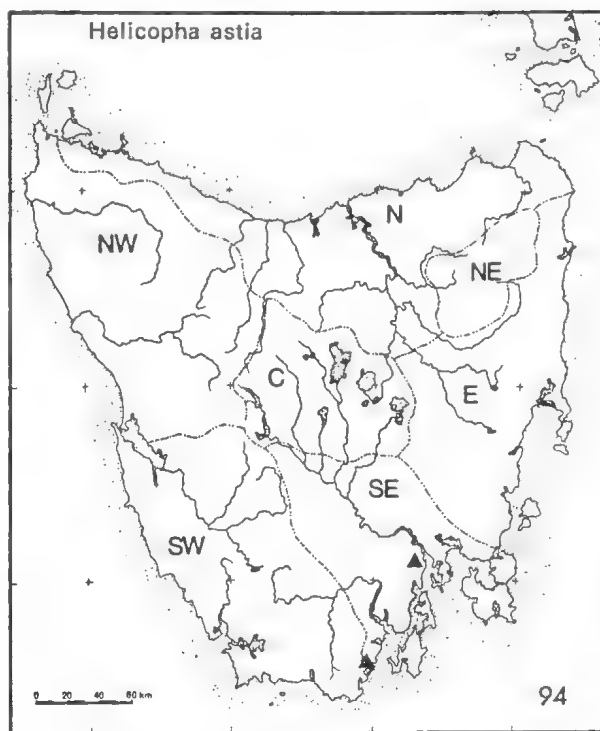
♀ abdomen broadly rounded at apex, a pair of small, slightly curved processes at the posterolateral angles; darkly pigmented pattern on sternite 6 and 7.

Length of anterior wing: ♂ 6-7 mm; ♀ 6-7 mm.

Type material: Type ♂ Hythe, Tas., Nov. 1939; 3 ♂ 1 ♀ paratypes same loc. and 4 ♂ paratypes Mt Wellington, Dec. 1939, J. W. Evans (BMNH). Type not seen.

The locality of the holotype ♂ of *Helicopha marlieri* Jacquemart, according to publication, is Mt Wellington, 24 Nov. 1922, A. Tonnoir (IRScNB).

The type material in the IRScNB collection was examined by the present author and was found to contain two microscope slides labelled '*Helicopha marlieri*, Mt Wellington 24.xi.22'; one contained the head and parts of thorax,



the other—two pairs of wings; the slide which should have contained the abdomen with genitalia could not be located. There were also three microscope slides labelled '*Helicopha delamarei*, Cradle 23.i.23'; one slide contained a part of an anterior wing and one posterior wing, a second slide contained the head and parts of the thorax, the third, the abdomen with genitalia. The examination of these slides left no doubt that the abdomen and genitalia labelled as '*delamarei*, Cradle 23.i.23', is the one figured and described as *marlieri*. The two small inwardly directed projections at the middle of the inferior appendages are both present, although they are not figured by Jacquemart, 1965 fig. 13A, B, C. All other details of the genitalia are also so similar to those of *Helicopha astia*, that the two are considered synonymous.

The mislabelled slide containing the abdomen of *H. marlieri* creates a discrepancy with the published locality. *Helicopha astia*, of which *marlieri* is a synonym, is found only in the southeast (Mt Wellington-Hythe), but *delamarei* entirely in the northwest; this leaves little doubt that the locality label also has been transposed.

The names on the slides containing wings correspond to the illustrations and their published localities, but some veins are not figured and some are incorrectly interpreted.

No additional material has been available for this study.

*Other recorded localities:* New South Wales—Ebor.

*Distribution:* Tasmania—SE province; New South Wales.

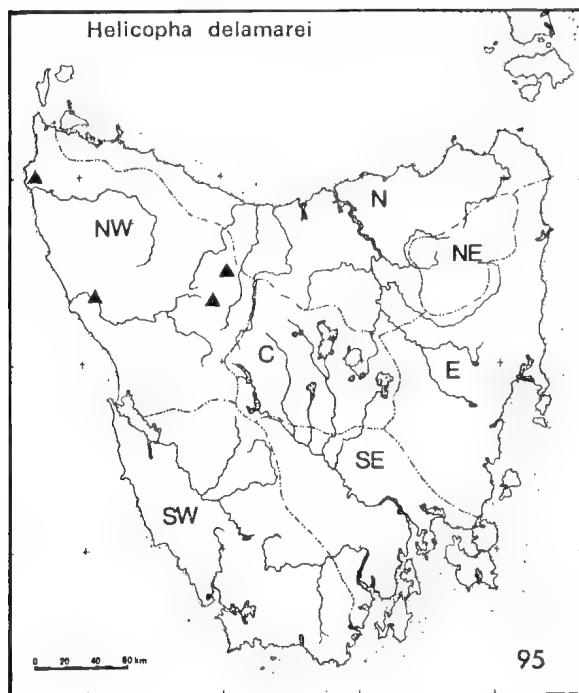
## 95 *Helicopha delamarei* Jacquemart

Figures 496-506

*Helicopha delamarei* Jacquemart, 1965b:15.

♂ genitalia with segment 10 elongate, somewhat parallel-sided, hood-shaped, rather broad distally, with small median excision. Superior appendages small. Inferior appendages single segmented, basal half directed upward, but at about the middle directed distally, apices in lateral view clavate; two or three-branched process arises from the inner basal section, but at about the middle there is a small inwardly directed projection. Sternite 7 without ventral process.

Genitalia figures prepared from a specimen collected at Corinna.



♀ abdomen dorsally terminates with an apically truncate plate; a small, finger-like process on either side; sternites 6, 7 and 8 with darkly pigmented pattern; sternite 6 also with a group of long, stiff bristles in the middle.

*Length of anterior wing:* ♂ 4.5-6.5 mm; ♀ 6-7 mm.

*Type material:* Holotype ♂ Cradle Mtn., Tas., 23 Jan. 1923, A. Tonnoir (IRScNB). Slide with abdomen and genitalia could not be located in the collection. The comments on identity of the type and locality discussed under *H. astia*.

*Material examined:* Tasmania—2 ♂ Corinna, 5 Nov. 1972; 3 ♂ Bull Creek, Cradle Mtn. Road, 13 Dec. 1974; 4 ♂ 4 ♀ Bluff Hill Creek, 12 km S of Marrawah, 30 Nov. 1974. All specimens collected by A. Neboiss (NMV).

*Distribution:* Tasmania—NW province.

## Genus *Alloecella* Banks

*Alloecella* Banks, 1939:481; Mosely and Kimmins, 1953:142.

*Type species:* *Alloecella grisea* Banks, 1939.

Antennae about as long as anterior wings; basal segment long, about as long as the head, second and third segment short, the following ones slender. Maxillary palpi long, all segments slender, segment 1 only slightly shorter than segment 2. Head dorsally with a pair of large posterolateral warts. Anterior wings with discoidal cell open; in some species males with more or less extensive longitudinal fold along R-Rs; males with one, females with two anal veins, position of anal veins differing in species and sexes. Basal half of costal margin in posterior wings with macrotrichia not distinctly closer together distally.

## KEY TO TASMANIAN SPECIES

1. Males ..... 2
- Females ..... 4
2. Anterior wing with longitudinal fold along R ..... 3
- Anterior wing without fold ..... *pilosa*
3. Fold not extending beyond the middle of anterior wing; A<sub>1</sub> terminating on wing margin ..... *grisea*
- Fold extending almost to the apex of the wing; A<sub>1</sub> terminating into Cu<sub>2</sub> ..... *longispina*

4. Ventral plates forming sternite 9 apically truncate . . . . . *grisea*  
 — Ventral plates forming sternite 9 apically rounded . . . . . 5  
 5. Distal end of plates forming sternite 9 smooth . . . . . *longispina*  
 — Distal end of plates forming sternite 9 ridged . . . . . *pilosa*

96 *Alloecella grisea* Banks

Figures 507-511

*Alloecella grisea* Banks, 1939:481.

*Alloecella warneria* Mosely in Mosely and Kimmins, 1953:144; Jacquemart, 1965b:13, Neboiss, 1974c:14. **syn. nov.**

The type of *grisea* agrees well with the illustrations of *warneria* in Mosely and Kimmins (1953) and both are regarded as being conspecific.

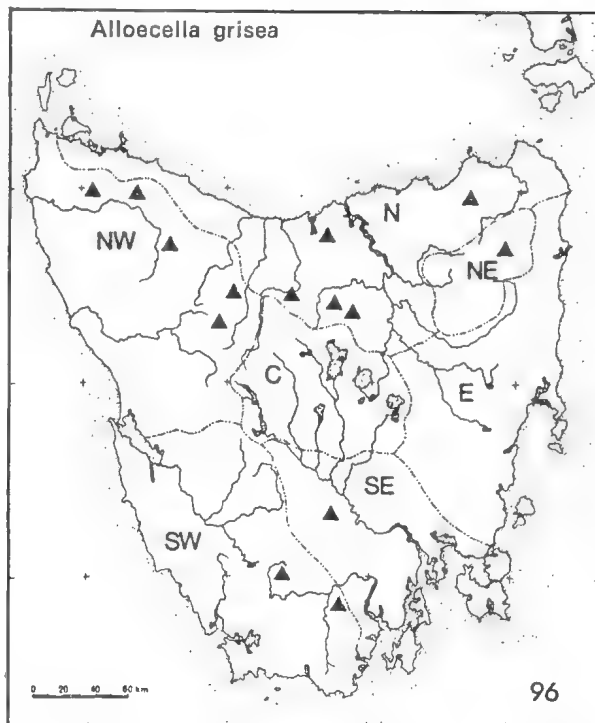
Anterior wings in the male with a fold along R not extending beyond the middle of the wing; A<sub>1</sub> terminates at the wing margin in both sexes. Head dorsally with a pair of large posterolateral warts, a pair of pale, rounded spots between them.

♂ genitalia with segment 10 long, narrow, deeply clefted in the middle; lateral horns long, slender, distally pointed, lying close and parallel to segment 10; in lateral view triangular, apically rounded protuberances represent superior appendages. Inferior appendages terminate in acute inward directed apices, a small spur arising on inner margin close to apex. Phallus rounded at base, apex laterally compressed, with a round central spot, lower margin produced into a deep keel. Broad spatulate process to sternite 7.

♀ abdomen terminates with a pair of concave lateral plates and a pair of ventral apically truncate plates. Sternite 8 with a broad, U-shaped, pigmented pattern, of which usually only the lateral lines are visible in uncleared specimens.

Length of anterior wing: ♂ 5.5-6 mm; ♀ 6-6.5 mm.

Type material: Holotype ♂ Mt Donna Buang, Victoria, 6-7 Dec. 1931, Harvard Aust. Exped. P. J. Darlington (MCZ Type 22109). The type specimen is now deposited in ANIC Canberra. Type seen.



Type of *A. warneria*: Holotype ♂, Fernshaw, Victoria, 21 Dec. 1884 from McLachlan's collection (BMNH). Type not seen.

Jacquemart (1965b) erroneously gave Kimmins as the author of *warneria* and the holotype locality—'Burnie 27.x.1922'.

Material examined: Tasmania—12 ♂ 4 ♀ Duck River, 6 km SW of Roger River, 29 Nov. 1974; 10 ♂ 2 ♀ Hellyer River Gorge, 12 Dec. 1974; 1 ♂ Dip River Falls, 1 Dec. 1974; 6 ♂ 1 ♀ Liffey River, 5 km W of Liffey, 2 Dec. 1974; 1 ♀ Dove River, Cradle Mtn. Nat. Park, 14 Dec. 1974; 1 ♂ Bull Creek, Cradle Mtn. Road, 13 Dec. 1974; 12 ♂ Quamby Brook, 1 km E of Golden Valley, 16 Dec. 1974; 2 ♂ 1 ♀ St. Columba Falls, Pyengana, 21 Feb. 1971; 2 ♂ Russell Falls, Nat. Park, 23 Feb. 1967; 1 ♂ same loc., 20 Feb. 1971; 1 ♂ 1 ♀ Arve River, 16 Feb. 1967; 2 ♂ Saxon Creek, 10 km NW Frankford, 19 Nov. 1972; 2 ♂ Condominion Creek nr. Mt Eliza, 9 Feb. 1965; 1 ♂ same loc., 15 Feb. 1971; 5 ♂ Sassafras Creek, 4 km W of Mole Creek, 8 Dec. 1972, P. Zwick; 31 ♂ 10 ♀ Grt. Forester River, 5 km NW of Forester, 11 Nov. 1972. All specimens collected by A. Neboiss unless stated otherwise (NMV).

Distribution: Tasmania—NW, N, NE, SE and SW provinces, Victoria.

97 *Alloecella longispina* Jacquemart

Figures 512-522

*Alloecella longispina* Jacquemart, 1965b:14.

This species is distinguished by the presence



of a long fold in the anterior wing of the male, extending along R almost the full length of the wing, but not shown in the original figure (Jacquemart, 1965, fig. 11D) and  $A_1$  terminating in  $Cu_2$  shortly before the wing margin. In female  $A_1$  terminates in  $Cu_2$  shortly before the wing margin. In female  $A_1$  terminates directly at wing margin. Head dorsally with large posterolateral warts, but the basal spots inconspicuous.

♂ genitalia with segment 10 extending as a pair of long, apically downturned processes, extending beyond the apices of the inferior processes, lateral horns appear as a pair of small protuberances on either side of the base; superior appendages short, digitiform. Phallus membranous, expanded distally, a small lateral lobe near the base. Inferior appendages single segmented, terminating in acute, inwardly directed apices. Broad spatulate ventral process on sternite 7.

♀ abdomen terminates bluntly; dorsally with a pair of broad, curved plates cleft in the middle; ventral plates rounded. Distal margin of sternite 8 darkly pigmented and covered with a row of long bristles.

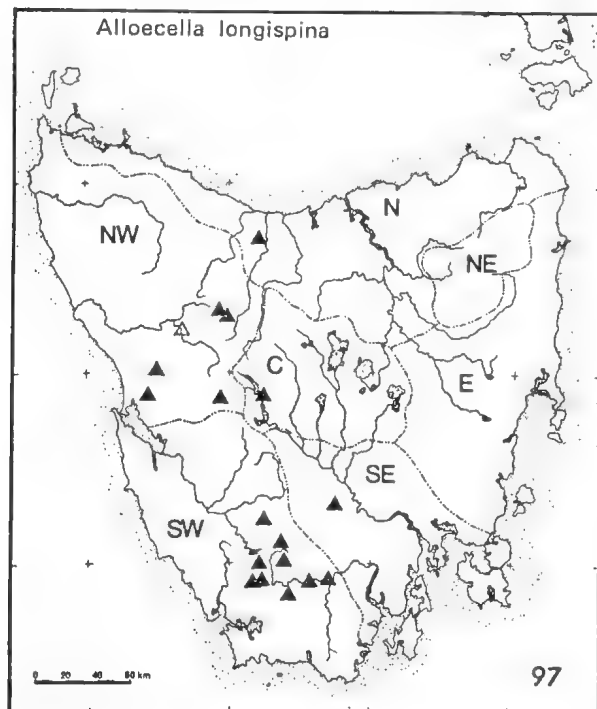
*Length of anterior wing:* ♂ 6-7 mm; ♀ 6.5-7.5 mm.

*Type material:* Holotype ♂ Cradle Mtn., Tas., 12 Jan. 1923, A. Tonnoir (IRScNB), dissected and mounted on four microscope slides. Type seen.

*Material examined:* Tasmania—10 ♂ 15 ♀ Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971; 2 ♂ 7 ♀ Lake Lilla, Cradle Mtn. Nat. Park, 14 Dec. 1974; 8 ♂ 12 ♀ Franklin River, 20 km SW Derwent Bridge, 11 Feb. 1971; 3 ♂ Russell Falls, Nat. Park, 23 Feb. 1967; 30 ♂ 7 ♀ Henty River, 12 km NW of Queenstown, 10 Feb. 1971; 82 ♂ 79 ♀ Huon-Picton River junction, 18 Feb. 1967; 1 ♂ Huon River Plains nr. Scotts Peak, 8 Feb. 1964; 3 ♂ 9 ♀ Junction Creek, West Arthur Plains, 7 Feb. 1966; 10 ♂ 3 ♀ Huon River Crossing, 16 Feb. 1971; 1 ♂ 1 ♀ West Arthur Plains, 3 Feb. 1965; 1 ♂ same loc., 6 Feb. 1965; 7 ♂ 30 ♀ Cracroft River, 8 Feb. 1966; 7 ♂ 6 ♀ Huon River nr. Blakes Opening, 9 Feb. 1966; 1 ♂ Condominion Creek, 9 Feb. 1965; 6 ♂ same loc., 15 Feb. 1971; 25 ♂ 8 ♀ Wedge River, 17 Feb. 1971. All specimens collected by A. Neboiss (NMV).

6 ♂ 2 ♀ Franklin River, 10 Feb. 1967, E. F. Riek (ANIC); 1 ♂ 10 mls E Strahan, 6 Feb. 1967, E. F. Riek (ANIC); 13 ♂ 36 ♀ Huon-Picton junction, 17 Feb. 1967, E. F. Riek (ANIC); 3 ♂ Derwent Bridge, 12 Feb. 1967, E. F. Riek (ANIC); 17 ♂ 6 ♀ Murchison River, 5 Feb. 1967, E. F. Riek (ANIC); 1 ♂ 1 ♀ 15 mls S Wilmut, 2000 ft, 30 Jan. 1967, E. F. Riek (ANIC).

*Distribution:* Tasmania—NW, SW and SE provinces.



## 98 *Alloecella pilosa* sp. n.

Figures 523-528

Similar to, but slightly smaller than the two preceding species, distinguished by characteristic genitalia. In male anterior wing,  $A_1$  terminates in  $Cu_2$  shortly before wing margin, in female  $A_2$  terminates at the wing margin.

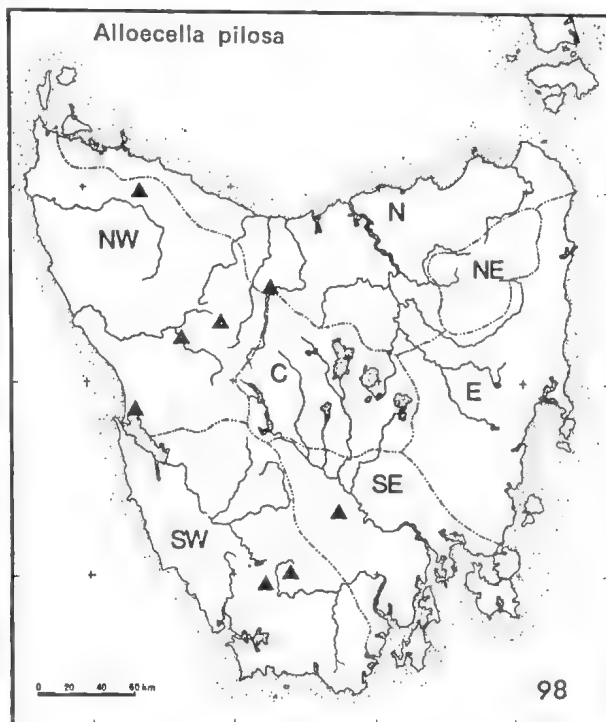
♂ genitalia with segment 10 slender, bifurcate, deeply cleft in the middle, not extending as far as the distal end of the inferior appendages, mid-ventral margin of each process with a long, slender projection. Superior appendages short, digitiform. Inferior appendages tapering to acute, inwardly directed apices, inner basal margin extended to a flat, angular lobe. Phallus long, apex gradually widened and curved downward, a ventral, collarlike flap near base. Small spatulate ventral process on sternite 7.

♀ abdomen terminates with broad, rounded dorsal plate, slightly produced and cleft in the middle, ventral plates rounded, obliquely



ridged. Sternite 8 narrow, sparsely covered with long bristles.

Length of anterior wing: ♂ 5-6 mm; ♀ 5.5-6.5 mm.



**Type material:** Holotype ♂ (T5208), allotype ♀ (T5209), 1 ♀ paratype (T5210) Lake Lilla, Cradle Mtn. Nat. Park, Tas., 14 Dec. 1974, A. Neboiss (NMV); 8 ♂ paratypes (T5211-T5218) 4 km E of Liena, Tas., 17 Nov. 1972, A. Neboiss (NMV); 1 ♂ paratype (T5219) Dip River Falls 10 km S of Mawbanna, Tas., 10 Dec. 1974, A. Neboiss (NMV).

**Other material examined:** Tasmania—1 ♂ West Arthur Plains, 3 Feb. 1965; 1 ♀ Murchison River 4 km S of Tullah, 12 Dec. 1974; 1 ♂ Condominion Creek nr. Mt Eliza, 9 Feb. 1965; 1 ♀ Hogarth Falls, Strahan, 10 Dec. 1974; 1 ♀ Russell Falls, Nat. Park, 23 Feb. 1967. All specimens collected by A. Neboiss (NMV).

**Distribution:** Tasmania—N, NW, SW and SE provinces.

## 17 Family CONOESUCIDAE Ross

1967 stat. nov.

In a similar fashion to the family Calocidae, Ross (1967) erected the subfamily Conoesucinae, stating only that it differs from subfamily

Sericostomatinae by 'atrophied scutal warts'. He did not name the genera to be included and the genus *Conoesucus* is the only one which is recognized by its name: consequently, it becomes the type genus.

The absence of mesoscutal warts is also given as the only distinguishing character by Malicky (1973). He indicates that the distribution is not limited to Australia and New Zealand, but extends to Asia and Africa, but except for genus *Conoesucus* from Australia, does not name any other genera.

The analysis of the Australian genera which do not possess mesoscutal warts, and were placed in the family Sericostomatidae by Mosely and Kimmins (1953), indicates that other structures of major importance also differ from typical sericostomatid species, and therefore the subfamily Conoesucinae is here raised to family level. The family diagnosis is prepared from the Australian species, hence some amendments might be necessary later, when more details of genera found elsewhere become available.

This move eliminates the family Sericostomatidae s. str. from the Tasmanian and Australian list. Six Australian genera—*Coenoria*, *Matasia*, *Hampa*, *Costora*, *Lingora* and *Conoesucus* and three New Zealand genera—*Pycnocentria*, *Olinga* and *Conuxia* are included in this family. All other Australian genera which were incorporated by Mosely and Kimmins in the Sericostomatidae are transferred to other families as follows:

*Antipodoecia* to family Antipodoeciidae

*Tamasia* to family Calocidae

*Caenota* to family Calocidae

*Tismana* = *Caloca* to family Calocidae

*Helicopsyche* to family Helicopsychidae

*Saetotricha* to family Helicopsychidae

*Tasimia* to family Tasimiidae

The New Zealand genera *Oeconesus*, *Pseudo-oconesus*, *Zelandopsyche*, *Tarapsyche* and *Zepsyche* are now placed in the family Oeconesidae, but three genera *Beraeoptera*, *Pycnocentrodes* and *Confluens* still remain in Sericostomatidae.

**Family diagnosis:** Ocelli absent. Antennae moderately stout, shorter than anterior wings;

basal segment long, segment 2 very short, segment 3 slightly longer than 2. Maxillary palpi in males 1 to 3-segmented, often partly or entirely membranous, upturned in front of the face and modified; in female 5-segmented, normal. Labial palpi 3-segmented, slender, segment 1 only slightly shorter than segment 2 or 3. Head dorsally with a pair of oval warts, similar in both sexes; postocular warts short. Pronotal warts long, narrow. Mesoscutum with deep, mesal depression anteriorly, warts absent; scutellum with a pair of warts.

In females the basal margin of sternite 5 with pigmented, transverse lines, a rounded loop produced distally on either side. Males without such structure.

Anterior wing venation often modified in males, discoidal cell present in both sexes, although sometimes modified in males of certain species; hyaline line along M, widened at the distal end of thyridial cell and occasionally extending along the cross-vein r-m below the discoidal cell; all three anal veins present, A<sub>1</sub> ends at the wing margin some distance basad from arculus. Posterior wings with bristle-like hairs along basal section of anterior margin; discoidal cell present in both sexes.

Spurs 2:2:2 or 2:2:4; mid- and posterior tibiae densely pubescent, sometimes with small spines.

The separation from the family Sericostomatidae *sensu stricto* is based on:

1. absence of transverse line on sternite 5 in males,
2. absence of warts on mesoscutum,
3. absence of hyaline area along cross-vein closing discoidal cell,
4. by A<sub>1</sub> ending some distance basad from arculus.

A revision of the entire group is required to establish the genera to be included in this family. The number of undescribed species from Australian mainland will undoubtedly influence the generic limitations, but such work is outside the scope of this paper, and therefore no attempt has been made to change the generic placings of some species at this stage.

The Tasmanian species at present are placed in five genera, although the distinction between

some of them are rather doubtful and based on male characteristics only.

#### KEY TO AUSTRALIAN GENERA OF THE FAMILY CONOESUCIDAE

1. Spurs 2:2:2 (not in Tasmania) *Coenoria*  
— Spurs 2:2:4 . . . . . 2
2. Anterior wing with base of fork 3 basad of cross-vein r-m . . . . . 3  
— Anterior wing with base of fork 3 at, or distad of cross-vein r-m . . . . . 4
3. Mesonotum wider than long; male anterior wing with curved, longitudinal groove; superior appendages in genitalia absent . . . . . *Hampa*  
— Mesonotum longer than wide; male anterior wing with one groove along Sc and another along Cu<sub>2</sub>; superior appendages in genitalia present . . . . . *Lingora*
4. Posterior wing with fork 1 sessile, or at the most with very short footstalk . . . . . 5  
— Posterior wing with footstalk of fork 1 as long as the width of the fork . . . . . *Matasia*
5. Male with bilobed hinged process on the frons . . . . . *Costora*  
— Male without bilobed process on the frons . . . . . *Conoesucus*

#### Genus *Hampa* Mosely

*Hampa* Mosely in Mosely and Kimmins, 1953:44.

*Type species: Hampa patona* Mosely, 1953.

This genus is very close to the New Zealand genus *Pynocentria*, but is separated from it by having fork 2 sessile in the anterior wing.

Head dorsally with pair of oval warts, similar in both sexes; postocular warts small. Maxillary palpi 2-segmented in males, segment 1 long, terminal segment very short; in females 5-segmented, normal. Frons with flat, broad, bilobed process in the male. Pronotal warts long and narrow; mesonotum wider than long, scutellum broadly triangular with pair of warts. Anterior wings with base of fork 3 basad of cross-vein r-m; hyaline line along M only.

Spurs 2:2:4.

#### 99 *Hampa patona* Mosely

Figures 529-533

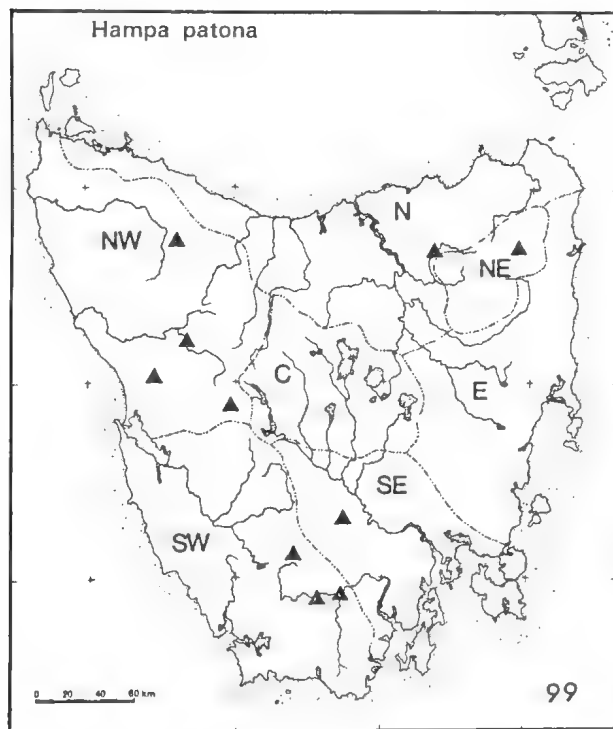
*Hampa patona* Mosely in Mosely and Kimmins, 1953: 44.

In the male, anterior wing with a single longitudinal groove; maxillary palpi 2-segmented, basal segment long, stout, terminal segment very short; a small, membranous, bilobed process on frons.

♂ genitalia with tergite 9 produced at its centre in an elongate triangle; segment 10 developed into a bilobed process on either side. Superior appendages absent. Phallus membranous with a pair of spurs apically. Inferior appendages bifurcate, branches widely separated, the upper branch in lateral view much wider than the lower one. The centre of sternite 9 produced into an arched process.

♀ abdomen terminates bluntly, sternite 9 formed by a pair of broad, triangular plates, rounded apically and separated near the base by a narrow V-shaped incision. Distal margin of sternite 8 sparsely covered with stiff bristles; short, triangular ventral projection on sternite 7.

Length of anterior wing: ♂ 5-6 mm; ♀ 6-7 mm.



*Type material:* Type ♂, 2 ♀ paratypes, Hampden, N.S.W., Jan. 1918, R. J. Tillyard (BMNH). Type not seen.

*Material examined:* Tasmania—12 ♂ 2 ♀ Henty River 12 km NW Queenstown, 10 Feb. 1971; 4 ♂ 12 ♀ Hellyer River Gorge, 9 Feb. 1971; 1 ♂ 2 ♀ National Park, 20 Feb. 1967; 3 ♀ Huon River crossing, 16 Feb. 1971; 34 ♂ Huon River nr. Blakes Opening, 11 Feb. 1966; 197 ♂ 102 ♀ Huon-Picton River junction, 18 Feb. 1967; 2 ♂ St. Columba Falls, Pyengana, 21 Feb. 1971; 28 ♂ St. Patricks River, Targa, 22 Feb. 1971; 17 ♂ 88 ♀ Franklin River 20 km SW Derwent Bridge, 11 Feb. 1971. All specimens collected by A. Neboiss (NMV).

15 ♂ 10 ♀ Franklin River, 10 Feb. 1967, E. F. Riek (ANIC); 12 ♂ 6 ♀ Huon-Picton junction, 17 Feb. 1967, E. F. Riek (ANIC); 8 ♂ 3 ♀ Murchison River, 5 Feb. 1967, E. F. Riek (ANIC); 4 ♂ 1 ♀ Hellyer Gorge, 4 Feb. 1967, E. F. Riek (ANIC).

Victoria—5 ♂ 8 ♀ Nariel, 12 Feb. 1963, A. Neboiss (NMV); 1 ♂ Yea River 7 km S Glenburn, 1 Dec. 1972, A. Neboiss (NMV); 1 ♂ Tanjil River, Walhalla Road bridge, 20 Feb. 1974, C. McCubbin (NMV).

*Distribution:* Tasmania—NW, SW, SE, NE and N provinces; Victoria; New South Wales.

### Genus *Matasia* Mosely

*Matasia* Mosely, 1936a:411; Mosely and Kimmins, 1953:42.

*Type species:* *Matasia satana* Mosely, 1936.

Antennae stout, slightly shorter than anterior wings, segment 1 enlarged. Maxillary palpi 5-segmented and normal in female; modified, membranous and 2-segmented in male, although Mosely expressed the belief that it was 3-segmented. Head dorsally with a pair of elongate warts; postocular warts small. Frons with broadly U-shaped process in the middle; membranous structures on either side of it absent. Pronotum with a pair of long and narrow warts; mesoscutum with deep mesal depression; scutellum with a pair of short warts. Wing venation irregular in the male anterior wings; discoidal cell present in both wings and both sexes. In female anterior wings, a narrow hyaline line along M, widened at anastomosis; a small hyaline area across Cu<sub>2</sub> near arculus.

Spurs 2:2:4.

### 100 *Matasia satana* Mosely

Figures 534-539

*Matasia satana* Mosely, 1936a:411; Mosely and Kimmins, 1953:42.

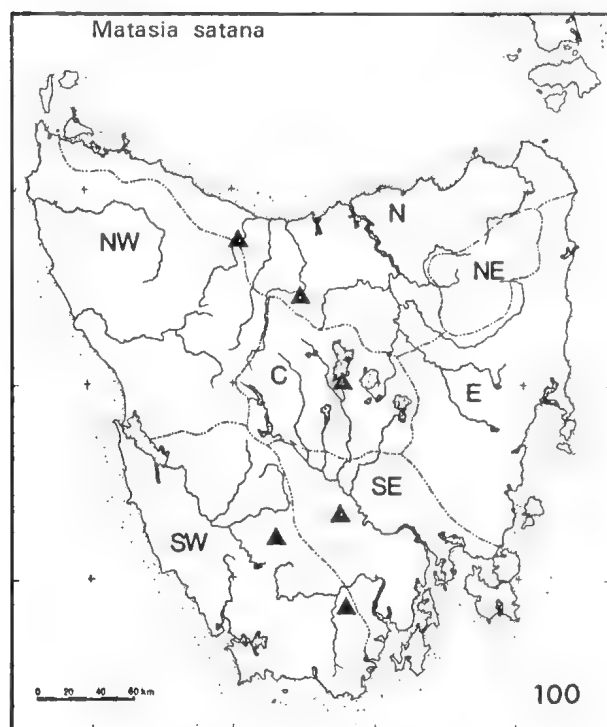
Wings densely covered with dark, blackish pubescence; in males there are two longitudinal folds, discoidal cell distinctly enlarged, an incomplete vein between R and Rs; in the centre a large area covered with short, upright, clavate

hairs. Sternite 7 with strong, apically rounded, flattened process; in female the process is short and triangular.

♂ genitalia with tergite 9 as strongly chitinated process; segment 10 slender, bifurcate, a pair of small dorsal processes at about the middle. Superior appendages absent. Inferior appendages large, ear-shaped.

♀ abdomen with posterior half of sternite 8 unpigmented, sparsely covered with stiff bristles; sternite 9 formed by a pair of widely separated, triangular, ventrally flattened plates.

*Length of anterior wing:* ♂ 5-6 mm; ♀ 5.5-7 mm.



*Type material:* Type ♂ Miena, Tas., Dec. 1929, H. M. Stephen (mounted in balsam), 1 ♂ paratype Miena, Tas., Dec. 1930, C. Parker (BMNH). Type not seen.

*Material examined:* Tasmania—47 ♂ 5 ♀ Arve River 10 km W of Geeveston, 15 Nov. 1972; 1 ♂ Sassafras Creek 4 km W of Mole Creek, 17 Nov. 1972; 2 ♂ Leven River nr. Heka, 17 Nov. 1972; 1 ♂ Tyenna River, National Park, 15 Nov. 1972; 2 ♂ 2 ♀ Wedge River, 5 Dec. 1972, P. Zwick. All specimens collected by A. Neboiss unless stated otherwise (NMV).

*Distribution:* Tasmania—SE, C, SW and N provinces.

## Genus *Costora* Mosely

*Costora* Mosely, 1936a:403; Mosely and Kimmins, 1953:45.

*Type species:* *Costora iena* Mosely, 1936.

Head dorsally with a pair of large warts; postocular warts small; maxillary palpi 2-segmented and modified in males, 5-segmented and normal in females. In the centre of frons in males a flat or rounded, bilobed process, possibly a kind of scent organ; in most species there is also a membranous structure located between the scent organ and the eyes. Pronotum with a pair of elongate warts; scutellum with a pair of long, slightly curved warts. Anterior wings with narrow hyaline line along M, widened near anastomosis, a small hyaline spot on Cu<sub>2</sub> near arculus; discoidal cell in both wings and both sexes shorter than its footstalk. In females a pale, broad, transverse band along with scattered stiff bristles.

Spurs 2:2:4.

## KEY TO THE SPECIES OF GENUS

### *COSTORA*

(Males only)

1. Anal veins in anterior wing short, fused and reduced . . . . . *delora*
- Anal veins in anterior wing normal, reaching close to anastomosis . . . . . 2
2. Anterior wing with short, longitudinal fold at the base of M; line of distinct black scales along Cu<sub>2</sub> near the base . . . . . *rotosca*
- Anterior wing without a fold or line of dark scales . . . . . 3
3. Segment 10 in lateral view curved upwards, gradually tapering; without apical processes . . . . . 4
- Segment 10 in lateral view widened to large, rounded lobes on either side shortly before the apex; a pair of long apical processes . . . . . *ebenina*
4. Segment 10 with a pair of dorsal projections near base . . . . . 5
- Segment 10 without dorsal projections . . . . . 6
5. Mid-dorsal projection of tergite 9 minutely bilobed at apex . . . . . *seposita*
- Mid-dorsal projection of tergite 9 minutely trilobed at apex . . . . . *luxata*

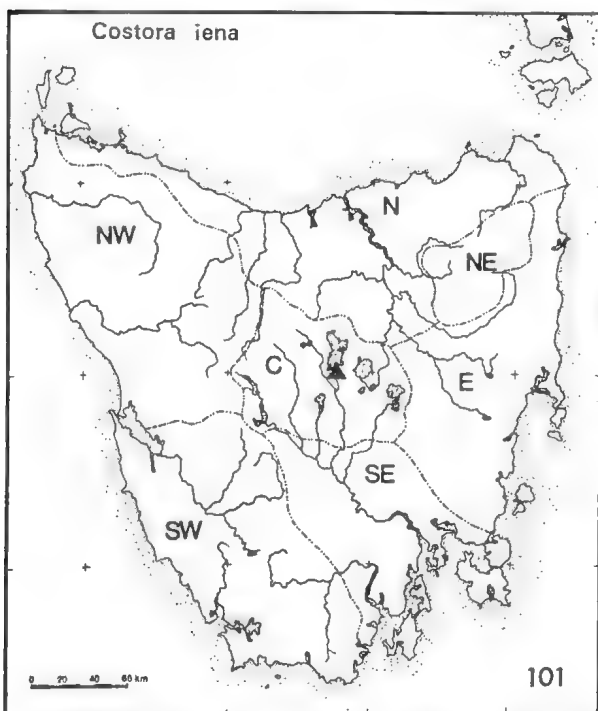
6. Inferior appendages with ventro-mesal projection long and slender . . . . . *ramosa*
- Inferior appendages with ventro-mesal projection short and stout . . . . . 7
7. Superior appendages slender, extending slightly beyond the apex of mid-dorsal projection of tergite 9 . . . . . *iena*
- Superior appendages short and stout, not reaching the apex of mid-dorsal projection of tergite 9 . . . . . *krene*

### 101 *Costora iena* Mosely

*Costora iena* Mosely, 1936a:403; Mosely and Kimmins, 1953:47.

The male of this species has been described and figured in the previous publications; the female, although listed among the paratypes, has not been described. The species is distinguished by the long and slender superior appendages, which extend slightly beyond the apex of mid-dorsal projection of tergite 9.

Length of anterior wing: ♂ 11 mm; ♀ 12 mm.



**Type material:** Type ♂ Great Lake, R. Shanon, Tas., Dec. 1934-Jan. 1935, C. Parker; ♂ ♀ paratypes Miena, Tas., Dec. 1930, C. Parker (BMNH). Type not seen.

No additional material has been available for this study.

**Distribution:** Tasmania—C province.

### 102 *Costora delora* Mosely

Figures 540-545

*Costora delora* Mosely in Mosely and Kimmins, 1953:49.

The colour of specimens fade considerably with time; this species is blackish-brown when alive, but fades to yellowish as noted by Mosely in the original description.

The male anterior wings have a conspicuous group of dark, upright hairs arising near the anal margin, close to the base of the wing. Anal veins are fused; a shallow longitudinal groove along M is densely covered with hairs. Wing venation in female normal, with all three anal veins present. The bilobed scent organ on the frons in the male rather narrow, deeply excised in the middle; on either side there is a membranous structure usually extending upwards beyond the base of antennae.

♂ genitalia very distinct, inferior appendages armed with several strong spines. Ventral margin of segment 9 with two widely separated long processes. Broad, spatulate ventral process on sternite 7.

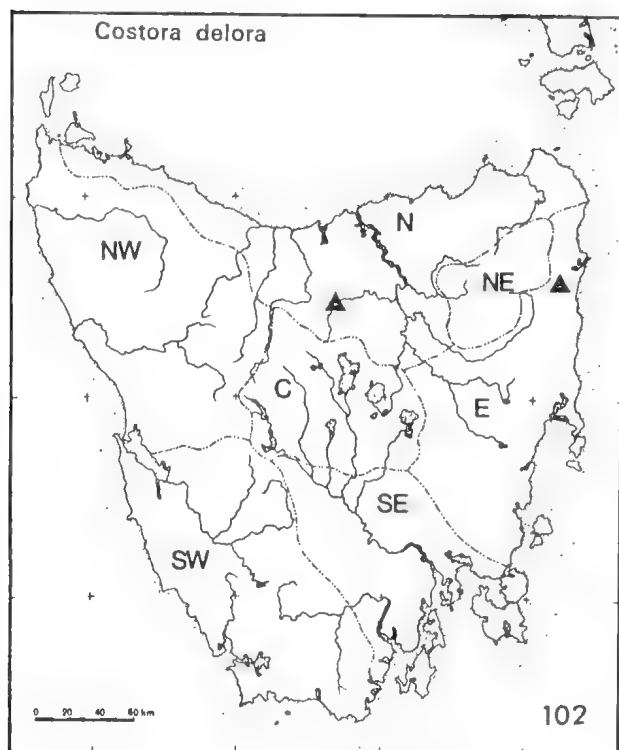
♀ abdomen with small, triangular ventral process on sternite 7; the pale transversal band with stiff bristles on sternite 8 interrupted in the middle; sternite 9 formed by two ventrally flattened plates, dorsally the abdomen terminates with a pair of elongate, apically rounded lobes.

Length of anterior wing: ♂ 7-7.5 mm; ♀ 8-9 mm.

**Type material:** Type ♂ Deloraine, Tas., 25 Dec. 1884, McLachlan Collection (BMNH). Type not seen.

**Material examined:** Tasmania—10 ♂ 58 ♀ Scamander River, Upper Scamander, 9 Nov. 1972. Victoria—9 ♂ 4 ♀ Yea River 7 km S of Glenburn, 1 Dec. 1972; 1 ♂ 3 ♀ 3 km SE of Taggerty, Little River, 6 Jan. 1972; 1 ♂ Cobungra, 30 Jan. 1957. New South Wales—1 ♂ 5 ♀ Thredbo, 21 Feb. 1967, N. Dobrotworsky. All specimens collected by A. Neboiss unless stated otherwise (NMV).

**Distribution:** Tasmania—N and E provinces; Victoria; New South Wales.



103 *Costora ebenina* sp. n.  
Figures 546-552

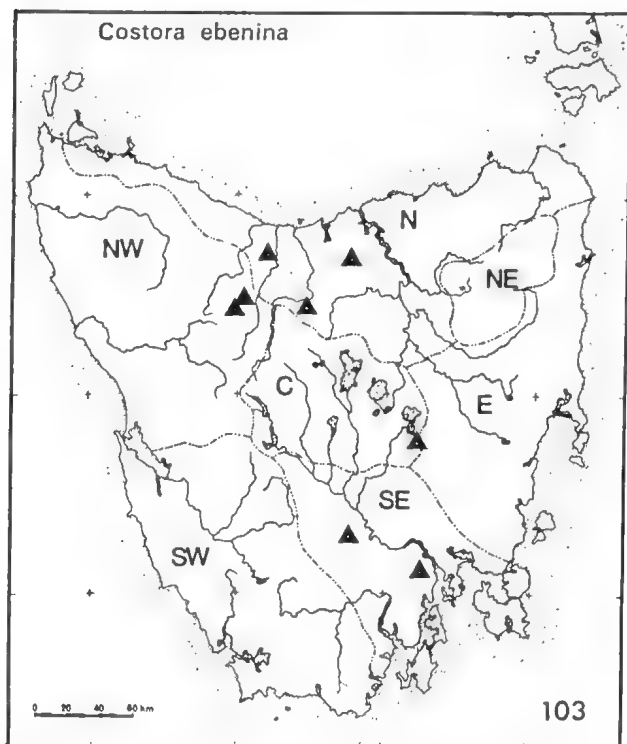
When alive this species is entirely black, but when preserved, gradually fades to yellowish-brown.

Wing venation in both sexes normal. The bilobed scent organ on frons in the male short and broad; membranous structure on either side small.

♂ *genitalia*: dorsal margin of tergite 9 forming a rather short, triangular process, segment 10 long, median incision deep, reaching nearly to the base; on either side a ventrally directed, rounded lobe near the apex; a long, twisted process at the tip on either side. Phallus slightly curved, stout. Superior appendages slender, in lateral view slightly widened distally. Inferior appendages laterally with a short upper and long lower branch, mesally at the base widened into a squarish plate, the apical angles of which are extended into long, upcurved spines. Strong ventral process on sternite 7.

♀ abdomen terminates dorsally with a pair of small lobes; ventrally sternite 9 with deep mesal incision; transversal band on sternite 8 entire, not interrupted in the middle; small, triangular ventral process on sternite 7.

Length of anterior wing: ♂ 6-7.5 mm; ♀ 7-9 mm.



*Type material*: Holotype ♂ (T5256), allotype ♀ (T5257), 4 ♂ paratypes (T5258-T5261) Bull Creek, Cradle Mtn. Road, Tas., 13 Dec. 1974, A. Neboiss, 2 ♂ paratypes (T5262-T5263) Sassafras creek 4 km W of Mole Creek, Tas., 17 Nov. 1972, A. Neboiss; 15 ♂ 1 ♀ paratypes (T5264-T5279) Iris River tributary 15 km W of Cradle Mtn., Tas., 13 Dec. 1974, A. Neboiss (NMV).

*Other material examined*: Tasmania—1 ♂ Franklin River, Frankford, 19 Nov. 1972, A. Neboiss (NMV); 2 ♂ 1 ♀ Russell Falls, Nat. Park, 23 Feb. 1967, A. Neboiss (NMV); 9 ♂ 1 ♀ same loc., 5 Dec. 1972, P. Zwick (NMV); 1 ♂ Mt Wellington, Hobart, 29 Jan. 1955, T. E. Woodward (QU); 12 ♂ Blackman River 15 km NW of Oatlands, 5 Dec. 1974, A. Neboiss (NMV); 1 ♂ Weaning Paddock Creek, 2250 ft., Cradle Mtn., 29 Jan. 1967, E. F. Riek (ANIC); 1 ♂ Russell Falls, 23 Feb. 1967, E. F. Riek (ANIC); 1 ♂ 15 mls. S Wilmot, 2000 ft., 30 Jan. 1967, E. F. Riek (ANIC).

*Distribution*: Tasmania—N, NW, C and SE provinces.

#### 104 *Costora ramosa* Jacquemart

Figure 553

*Costora ramosa* Jacquemart, 1965b:12.

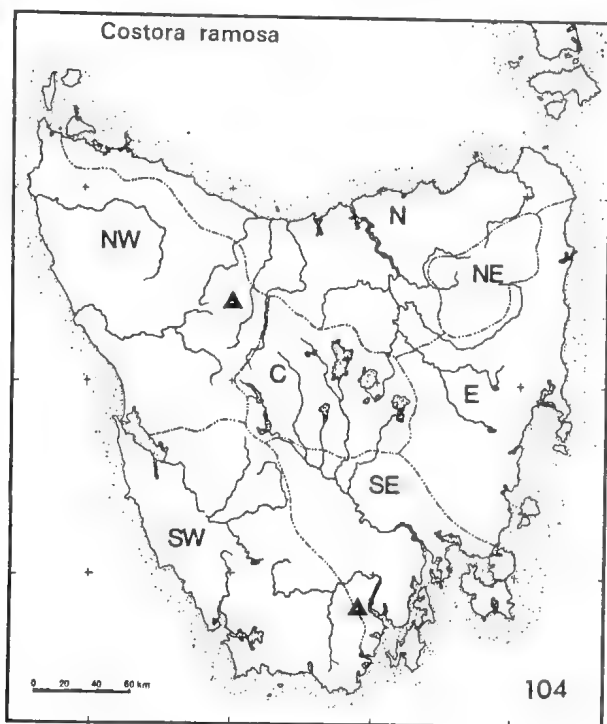
Dark, blackish-brown species. Wing venation

normal, frons with the bilobed scent organ rather broad, the membraneous structures on either side small. Broad ventral process on sternite 7.

♂ genitalia with dorsal margin of tergite 9 developed into a triangular process; segment 10 long, bifurcate, curved upwards and tapering apically. Superior appendages short, stout. Inferior appendages each with four, approximately equal-sized, marginal projections, and one long, slender, ventro-mesal projection.

♀ unknown.

Length of anterior wing: ♂ 6-7 mm.



*Type material:* Holotype ♂ Geeveston, Tas., 4 Feb. 1922, A. Tonnoir (IRScNB). Dissected and mounted on four microscope slides. Type examined.

Date on labels, none of which has been written by Tonnoir, is incorrect, because he did not arrive in Tasmania until late October 1922 and departed early February 1923 (Neboiss 1974c). Other insects captured at Geeveston and described by Tonnoir himself, were collected on 4 Dec. 1922, and it is reasonable to assume that this should also be the date for the holotype of *C. ramosa*.

*Other material examined:* Tasmania—1 ♂ Iris River tributary 15 km N of Cradle Mtn., 13 Dec. 1974, A. Neboiss (NMV).

*Distribution:* Tasmania—NW and SE provinces.

### 105 *Costora krene* sp. n.

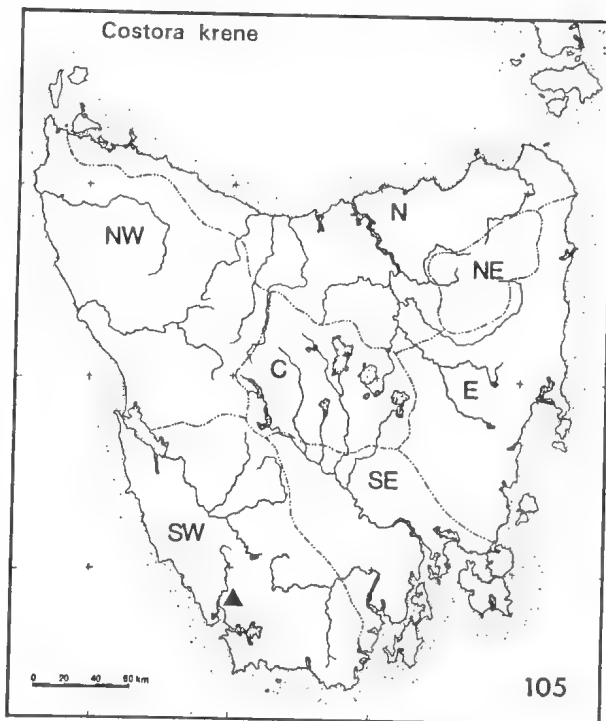
Figures 554-555

A small, brownish species, closely resembling *ramosa*, but differing in details of male genitalia. Wing venation normal. The bilobed scent organ on the frons broad, the membraneous structure small. Broad ventral process on sternite 7.

♂ genitalia with dorsal margin of tergite 9 developed into a triangular process; segment 10 slender, bifurcate, curved upwards and tapering apically. Superior appendages short, stout. Inferior appendages each with five unequal-sized marginal projections, the ventromesal projection short and stout, larger than the preceding marginal projection.

♀ unknown.

Length of anterior wing: ♂ 5.5 mm.



*Type material:* Holotype ♂ (T5280) Spring River, Tas., 5 Feb. 1966, A. Neboiss (NMV).

*Distribution:* Tasmania—SW province.



106 *Costora seposita* sp. n.

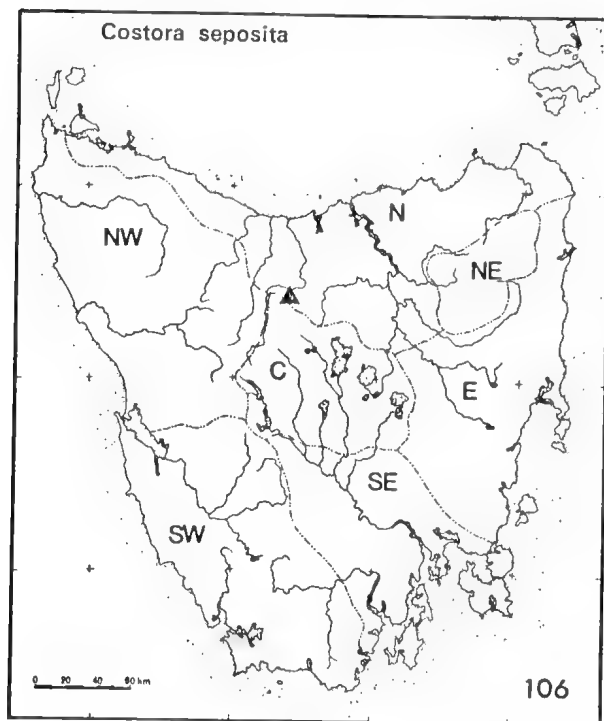
Figures 556-559

Dark, blackish-brown species. Wing venation normal. The bilobed scent organ as well as the membranous structure on the frons present. Broad ventral process on sternite 7.

♂ genitalia with segment 9 rather broad, dorsal margin extended distally to a moderately broad, apically bilobed process; the segment 10 bifurcate, rather broad, apically tapered, slightly flattened dorso-ventrally and curved upwards; dorsally at the base a pair of short, flat processes, truncate at apex, lower angle slightly produced. Superior appendages short and stout. Inferior appendages broad with unequal-sized marginal projections.

♀ unknown.

Length of anterior wing: ♂ 7 mm.



Type material: Holotype ♂ (T5281) Creek near Marakooopa Caves, Tas., 15 Dec. 1974, A. Neboiss (NMV).

Distribution: Tasmania—N province.

107 *Costora luxata* sp. n.

Figures 560-564

Dark brown species. Wing venation normal.

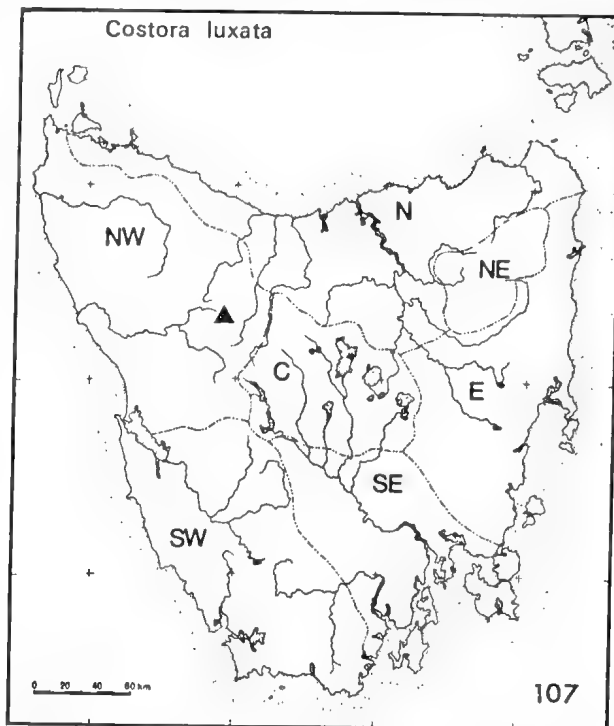
The bilobed scent organ on frons very small; membranous structure entirely absent. Broad ventral process on sternite 7.

♂ genitalia with dorsal margin of tergite 9 extended distally to a moderately broad, apically trilobed process. Segment 10 bifurcate, slender, apically tapered, slightly curved upwards; a pair of small, rounded dorsal projections near the base. Superior appendages short. Inferior appendages curved, each ventro-mesally extended to a flat trifold lobe.

♀ unknown.

Length of anterior wing: ♂ 5.5 mm.

Type material: Holotype ♂ (T5282), 1 ♂



paratype (T5283) Waldheim, Cradle Mtn. Nat. Park, Tas., 7 Feb. 1971, A. Neboiss (NMV).

Distribution: Tasmania—NW province.

108 *Costora rotosca* Mosely

Figures 565-569

*Costora rotosca* Mosely in Mosely and Kimmins, 1953:49.

Dark brown species. Anterior wings in male with a short fold along M near the base; a conspicuous line of dark scales along Cu<sub>2</sub>. Wing venation in both sexes normal, but differing

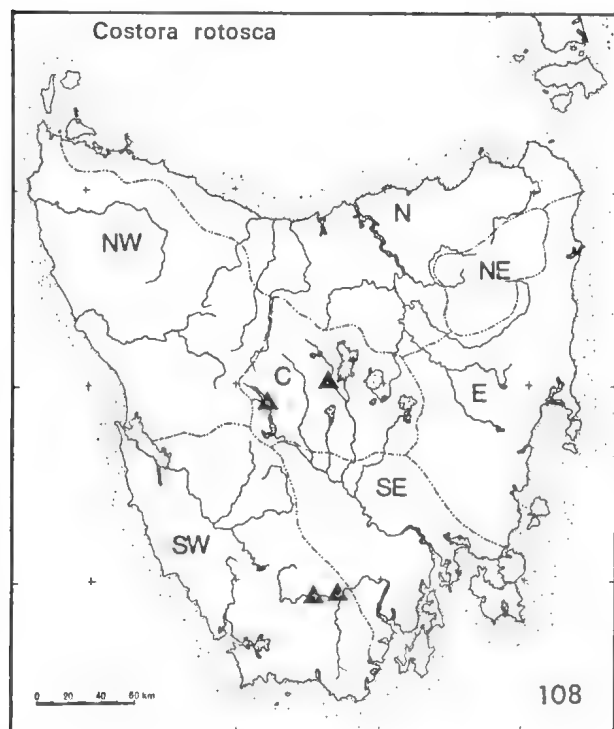


from other species in the genus by having the distal end of  $Cu_2$  connected by short veins to  $Cu_1b$  as well as to the wing margin. The bilobed scent organ on frons distinct, a pair of long bristles on each lobe; the membraneous structures not present. In female the anterior margin of sternite 5 with pigmented dark line, roundly produced on either side; sternite 7 without ventral projection. In male a broad ventral projection on sternite 7 present.

♂ genitalia with segment 9 broad, dorsal margin produced in the middle to apically trifid projection. Segment 10 short, diverging apically. Superior appendages short, dilated apically. Inferior appendages in lateral view narrow, small projections along outer margin, ventro-mesal projection wider, trifid apically.

♀ abdomen terminates with a pair of rounded dorsal lobes; broad transversal band on sternite 8 covered with stiff bristles.

*Length of anterior wing:* ♂ 7-8 mm; ♀ 7-8.5 mm.



*Type material:* Type ♂ Tasmania (without definite locality), J. W. Evans (BMNH). Type not seen.

*Material examined:* Tasmania—1 ♂ Ouse River 8 km W of Miena, 5 Dec. 1974; 1 ♂ Huon River nr. Blakes Opening, 9 Feb. 1966; 21 ♂ 3 ♀ Huon-Picton River junction, 18 Feb. 1967. All specimens collected by A. Neboiss (NMV). 5 ♂ Huon-Picton junction, 17 Feb. 1967, E. F. Riek (ANIC); 2 ♂ Derwent Bridge, 12 Feb. 1967, E. F. Riek (ANIC).

*Distribution:* Tasmania—C and SW provinces.

### Genus *Lingora* Mosely

*Lingora* Mosely, 1936a:406; Mosely and Kimmins, 1953:93.

*Type species:* *Lingora aurata* Mosely, 1936.

Head dorsally with a pair of large warts, postocular warts small; antennae shorter than anterior wings, segment 1 about as long as the head, segment 2 and the subsequent segments short. Maxillary palpi single segmented, membraneous, modified in males; 5-segmented, normal in females. Frons in males without bilobed scent organ and without membraneous structures. Pronotum with a pair of long and narrow warts; mesoscutum without warts, but with deep mesal depression; scutellum with a pair of elongate warts. Anterior wings in males with longitudinal grooves, venation irregular, posterior wings normal; in females wing venation normal, in the anterior wing a narrow hyaline line along M widened at anastomosis. Discoidal cell present in both wings and both sexes. In females the anterior margin of sternite 5 with curved, laterally produced darkly pigmented line.

Spurs 2:2:4.

The two Tasmanian species are separated by the shape of inferior appendages.

### 109 *Lingora aurata* Mosely

Figures 570-579

*Lingora aurata* Mosely, 1936a:407; Mosely and Kimmins, 1953:93.

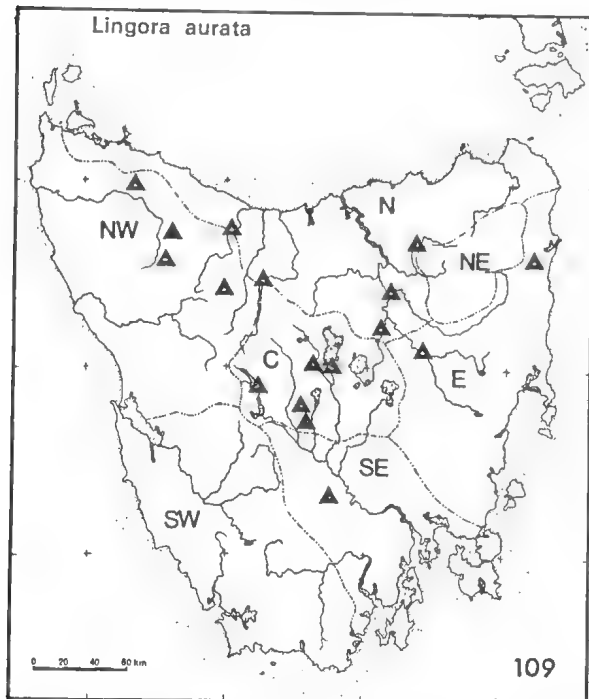
*Lingora caparti* Jacquemart, 1965b:8 *syn. nov.*

Anterior wings in males densely covered with yellowish-brown hairs, showing golden lustre in live specimens, two longitudinal grooves, one along Sc, the other along  $Cu_2$  bent forward at anastomosis, specialized upright standing hairs on major veins; in females the anterior wings with two patches of golden pubescence, one near the base of the wing, the second at anastomosis.

♂ genitalia with tergite 9 produced in the middle to an apically pointed projection, the lateral margins becoming membranous and extending below phallus to join segment 10 above, which is formed by a pair of blade-like processes. The membranous plate below phallus was overlooked by Mosely (1936), who observed only the more sclerotized triangular apical section, therefore the illustrated ventral aspect of the male genitalia is incomplete. Superior appendages clavate apically and situated at the base of segment 10. Inferior appendages in lateral view broad apically with slender stems. A pair of long, slender, upcurved spines arising from the interrupted ventro-mesal section of segment 9. Broad, spatulate ventral process on sternite 7.

♀ abdomen terminates with deeply excised sternite 9; a broad transversal band of stiff bristles along posterior margin of sternite 8, and a short, triangular ventral process on sternite 7.

Length of anterior wing: ♂ 5.6-5 mm; ♀ 5.5-7 mm.



Type material: Type ♂ and paratype ♂ Great Lake, Miena, Tas., Dec. 1930, C. Parker (BMNH). Type not seen.

Holotype ♂ of *Lingora caparti* Jacquemart, 'N. Port 16 Dec. 1922', A. Tonnoir (IRScNB), dissected and mounted on three microscope slides. Type examined and found that the genitalia agree in all respects with those of *aurata*. The two names apply to one species and *caparti* becomes a synonym of *aurata*.

The locality 'N. Port' refers to the township of National Park, near Russell Falls (Neboiss 1974c).

Material examined: Tasmania—2 ♂ 2 ♀ St. Patrick's River, Targa, 22 Feb. 1971; 2 ♂ 1 ♀ South Esk River, Evandale, 1 Mar. 1967; 4 ♂ 2 ♀ Macquarie River 8 km W of Campbell Town, 9 Nov. 1972; 5 ♂ 2 ♀ Lake River 5 km SW Delmont, 9 Nov. 1972; 3 ♂ Leven River nr. Heka, 17 Nov. 1972; 1 ♀ Mersey River, Liena, 16 Nov. 1972; 3 ♂ Dip River Falls, 1 Dec. 1974; 43 ♂ 1 ♀ Derwent River 2 km NW Derwent Bridge, 12 Feb. 1971; 27 ♂ 7 ♀ Bradys Lake, 9 Dec. 1974; 1 ♂ Nive River 2 km W of Bronte, 5 Dec. 1974; 1 ♂ Ouse River 8 km W of Miena, 28 Feb. 1967; 8 ♂ 3 ♀ Iris River tributary 15 km W of Cradle Mtn., 13 Dec. 1974; 10 ♂ 61 ♀ Scamander River, Upper Scamander, 9 Nov. 1972. All specimens collected by A. Neboiss (NMV). 1 ♂ 1 ♀ Evandale, 1 Mar. 1967, E. F. Riek (ANIC); 1 ♂ Fossey River 10 S Hellyer Gorge, 5 Feb. 1967, E. F. Riek (ANIC); 1 ♂ Hellyer Gorge, 4 Feb. 1967, E. F. Riek (ANIC).

Distribution: Tasmania—E, N, C, SE and NW provinces.

## 110 *Lingora vesca* sp. n.

Figures 580-583

Anterior wings similar to those of *aurata* with two longitudinal grooves and specialized hairs; colour yellowish-brown, with golden lustre.

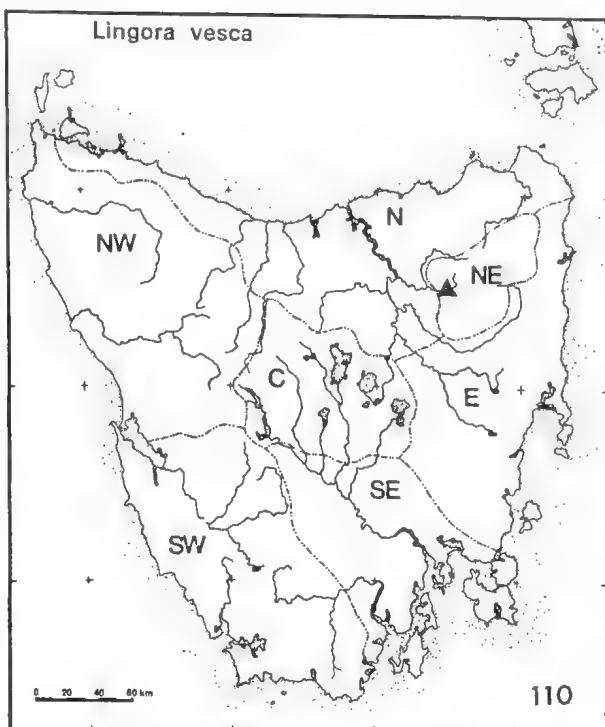
♂ genitalia is characterized by diverging apices of segment 10, shorter and broader membranous plate below phallus and rather short, narrow and (in lateral view) obliquely truncate apices of the inferior appendages. The middle projection of tergite 9 rounded apically; the long, slender, upcurved processes arising from the ventro-mesal margin bowed outward in the middle. Broad, spatulate ventral process on sternite 7 present.

♀ unknown.

Length of anterior wing: ♂ 5.5 mm.

Type material: Holotype ♂ (T5284) North Esk River, Blessington, Tas., 1 Mar. 1967, A. Neboiss (NMV).

Distribution: Tasmania—NE province.



### Genus *Conoesucus* Mosely

*Conoesucus* Mosely, 1936a:408; Mosely and Kimmins, 1953:87.

Type species: *Conoesucus fromus* Mosely, 1936.

Head dorsally with a pair of large, oval warts situated close to the eyes; postocular warts small, antennae shorter than anterior wings; maxillary palpi in males 3-segmented, lying close to the face, directed upwards, segment 1 short, segment 2 long, segment 3 modified and differing in species; in females, maxillary palpi 5-segmented and normal. Pronotum with a pair of elongate warts; mesoscutum without warts, but a pair on scutellum. Anterior wings with narrow hyaline line along M, widened near anastomosis, a small hyaline spot near arculus; in males usually a more or less distinct fold along R near the base; discoidal cell present and closed in both sexes, about as long or longer than its footstalk.

Spurs 2:2:4; mid-tibia sometimes with a few small spines.

#### KEY TO THE SPECIES OF GENUS

##### *CONOESUCUS*

(Males only)

1. Abdominal sternite 7 with broad spatulate

- ventral process . . . . . 2
- Abdominal sternite 7 without broad spatulate ventral process . . . . . 3
- 2. Abdominal segment 9 with lateral margin produced to somewhat triangular lobe . . . . . *norelus*
- Abdominal segment 9 with lateral margin curved . . . . . *fromus*
- 3. Segment 10 in lateral view slightly curved upwards, apex broad, rounded . . . . . *digitiferus*
- Segment 10 in lateral view with distal end turned upwards at almost a right angle, tapering to somewhat triangular apex 4
- 4. Posterior wing fork 1 with footstalk . . . . . *nepotulus*
- Posterior wing fork 1 sessile or nearly so . . . . . *brontensis*

### 111 *Conoesucus fromus* Mosely

Figures 584-588

*Conoesucus fromus* Mosely, 1936a:409; Mosely and Kimmins, 1953: 88.

*Conoesucus moselyi* Jacquemart, 1965b:12 *syn. nov.*

Dark, blackish species, both pairs of wings densely pubescent; in anterior wing  $Cu_2$  joins  $Cu_1$ ;b; in posterior wing Sc joins R shortly before wing margin. In males the longitudinal fold along R in the anterior wing reaches nearly as far as the distal end of the discoidal cell. Maxillary palpi in male 3-segmented, flattened, segments 1 and 3 short, segment 2 longer than 1 and 3 together. Broad spatulate ventral process on sternite 7 in male, a small, pointed one in female.

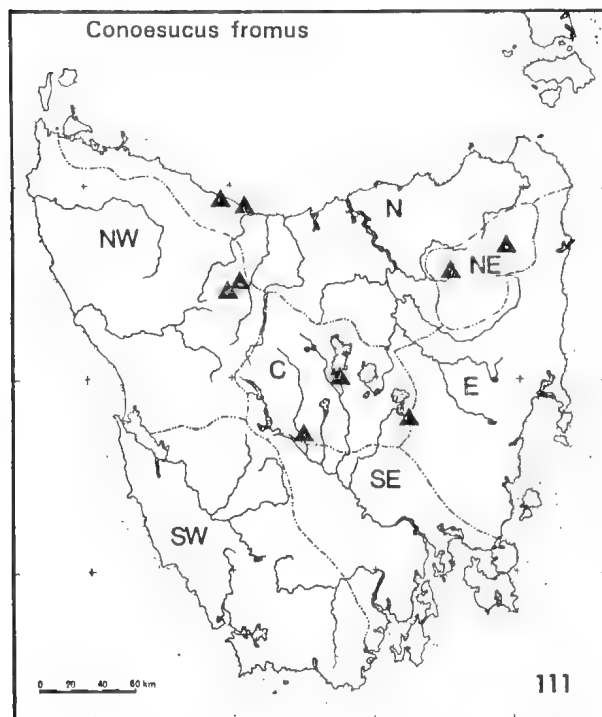
♂ genitalia with dorsal margin of tergite 9 produced distally into a pair of short, broad, apically rounded processes. Superior appendages very short, rounded. Segment 10 formed by a pair of parallel, laterally somewhat flattened, apically upcurved processes. Phallus parallel sided, rather large, slightly curved downwards. Inferior appendages broad, concave, two-branched, upper branch broad, apically rounded, lower branch smaller, the outer margin between the two branches with irregular, more or less distinct excisions which differ even between the two sides in a single specimen; a pair of long processes with twisted apices arise from the inner basal margin, curve

up and protrude posteriorly on either side of phallus.

The examination of available specimens show that the type of *C. moselyi* Jacquemart is only a variant of *C. fromus*.

♀ abdomen terminates bluntly, but can be separated from other species by the shape of ventral incision.

Length of anterior wing: ♂ 6-7.5 mm; ♀ 7-8 mm.



**Type material:** Type ♂, paratype ♀ Miena, Great Lake, Tas., Dec. 1930, C. Parker (BMNH). Type not seen.

**Holotype** ♂ of *Conoesucus moselyi* Jacquemart, Burnie, Tas., 27 Oct. 1922, A. Tonnoir (IRScNB). Specimen dissected and mounted on four microscope slides. Type seen.

**Material examined:** Tasmania—2 ♂ Blackman River 15 km NW Oatlands, 5 Dec. 1974; 1 ♂ 5 km W of Bronte, small creek, 8 Nov. 1972; 10 ♂ 1 ♀ Iris River tributary 15 km N of Cradle Mtn., 13 Dec. 1974; 15 ♂ 1 ♀ Ulverstone, waterfalls 4 km NW, 18 Nov. 1972; 1 ♂ Bull Creek, Cradle Mtn. Road, 13 Dec. 1974; 1 ♂ St. Columba Falls, Pyengana, 21 Feb. 1971. All specimens collected by A. Neboiss (NMV). 1 ♂ North Esk River, 27 Nov. 1959, D. Scholes (ANIC).

**Distribution:** Tasmania—NE, N, C and NW provinces.

## 112 *Conoesucus norelus* Mosely Figures 589-593

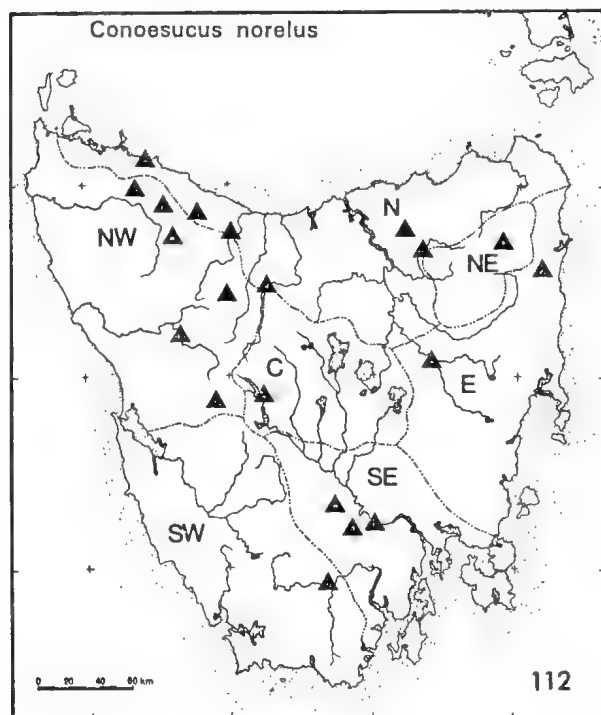
*Conoesucus norelus* Mosely in Mosely and Kimmins, 1953:90.

Small, dark species, wings densely covered with fine pubescence. Anterior wings in males with longitudinal fold along R; Cu<sub>2</sub> in both sexes joins Cu<sub>1</sub>b. Maxillary palpi in males 3-segmented, flattened, segments 1 and 3 short, segment 2 longer than 1 and 3 together. Broad, spatulate ventral process on sternite 7 in male, a short, triangular one in female.

♂ genitalia with segment 9 laterally produced into a somewhat triangular lobe; dorsal margin extended distally into a pair of broad, slightly curved processes. Superior appendages short, rounded. Segment 10 in the form of two slender, apically upcurved rods. Inferior appendages curved upwards, outer margin irregularly serrate; an acute spur arising mesally near the base, directed inwards; a pair of long, slender processes arising from inner basal margin and situated on either side of phallus.

♀ abdomen terminates bluntly with end tergite concave in the middle; ventral incision wider near the base.

Length of anterior wing: ♂ 5-6.5 mm; ♀ 6-7 mm.



**Type material:** Type ♂ New Norfolk, Tas., Mar. 1938, J. W. Evans (BMNH). Type not seen.

**Material examined:** Tasmania—1 ♂ 1 ♀ Plenty River 6 km E of Moogara, 7 Dec. 1974; 1 ♂ Dip River Falls, 1 Dec. 1974; 5 ♂ 3 ♀ Lilydale, creek 2 km N, 16 Dec. 1974; 1 ♂ Flowerdale River, Meunna, 4 Nov. 1972; 1 ♂ Tyenna River, National Park, 6 Dec. 1972, P. Zwick; 1 ♂ Guide River Falls nr. Ridgley, 18 Nov. 1972; 2 ♂ St. Columba Falls, Pyengana, 21 Feb. 1971; 4 ♂ 10 ♀ St. Patricks River, Targa, 22 Feb. 1971; 3 ♂ 7 ♀ Scamander River, Upper Scamander, 9 Nov. 1972; 4 ♂ 4 ♀ Huon-Picton River junction, 18 Feb. 1967; 6 ♂ 3 ♀ Hellyer River Gorge, 9 Feb. 1971; 4 ♂ same loc., 12 Dec. 1974; 5 ♂ 12 ♀ Franklin River 20 km SW of Derwent Bridge, 11 Feb. 1971; 23 ♂ 36 ♀ Leven River nr. Heka, 17 Nov. 1972; 1 ♀ Derwent River 2 km NW Derwent Bridge, 12 Feb. 1971; 95 ♂ 116 ♀ Mersey River, Liena, 16 Nov. 1972; 1 ♂ Wilson Creek nr. Hellyer, 29 Nov. 1974; 4 ♂ 5 ♀ Derwent River 3 km W of New Norfolk, 7 Dec. 1974; 8 ♂ 5 ♀ Macquarie River 8 km W Campbell Town, 9 Nov. 1972; 1 ♀ Iris River trib., 15 km N of Cradle Mtn., 13 Dec. 1974. All specimens collected by A. Neboiss unless stated otherwise (NMV). 1 ♂ 4 ♀ Murchison River, 5 Feb. 1967, E. F. Riek (ANIC); 5 ♂ 4 ♀ Hellyer Gorge, 4 Feb. 1967, E. F. Riek (ANIC).

**Distribution:** Tasmania—all provinces.

### 113 *Conoesucus digitiferus* Jacquemart

Figures 594-599

*Conoesucus digitiferus* Jacquemart, 1965b:9.

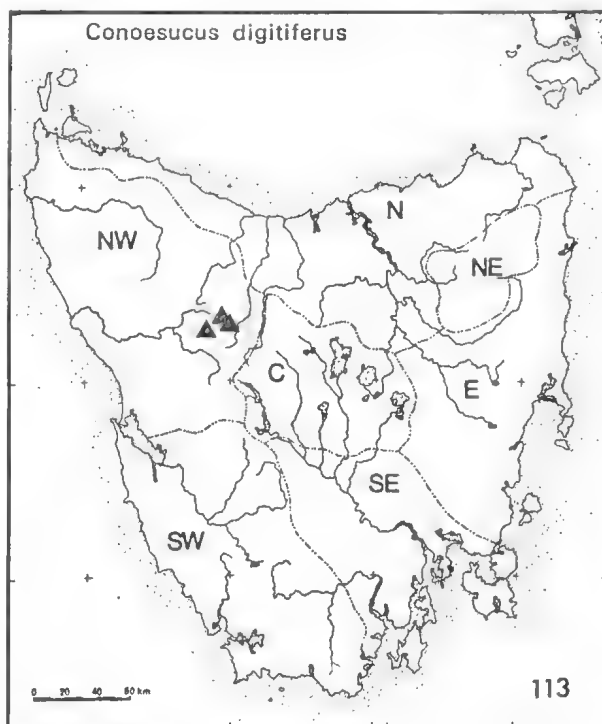
Dark, blackish species. The anterior wings in both sexes with basal section of R thickened and elevated, but without longitudinal fold; Cu<sub>2</sub> ends at wing margin and a short cross-vein near the apex connects it with Cu<sub>1</sub>b. Maxillary palpi 3-segmented in male, segment 1 short, segment 2 about twice as long, broad; segment 3 membranous, covered with brush of long hairs. Posterior wing in both sexes with Sc and R running separate to the wing margin. There are no ventral processes on the abdomen in either sex, although in females the posterior margin of sternite 7 is broadly curved posteriorly and thickened.

♂ **genitalia:** segment 9 with dorsally elevated, transverse ridge, produced posteriorly in the middle; distal margin extended to a pair of long, broad, slightly curved and apically rounded processes. Superior appendages short, rounded apically. Segment 10 formed by a pair of laterally compressed, slightly upcurved processes. Phallus dilated laterally near the apex.

Inferior appendages concave, broad at base, outer margin irregularly excised; a pair of long, slender processes arise from the inner basal margin, curve up and protrude posteriorly on either side of phallus; a small mesal projection on each process near the base.

♀ abdomen terminates with mesal dome, ventral plate with small mesal excision.

**Length of anterior wing:** ♂ 7-7.5 mm; ♀ 8-9.5 mm.



**Type material:** Holotype ♂ 'Bradle' misspelling for Cradle Mtn., Tas., 12 Jan. 1923, A. Tonnoir (IRScNB). Specimen dissected and mounted on three microscope slides. Type seen.

**Material examined:** Tasmania—18 ♂ 7 ♀ Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971, A. Neboiss (NMV); 1 ♂ Cradle Mtn., Lake Dove, 9 Dec. 1972, P. Zwick (NMV); 4 ♂ 6 ♀ Lake Lilla, Cradle Mtn. Nat. Park, 14 Dec. 1974, A. Neboiss (NMV).

**Distribution:** Tasmania—NW province.

### 114 *Conoesucus nepotulus* sp. n.

Figures 600-603

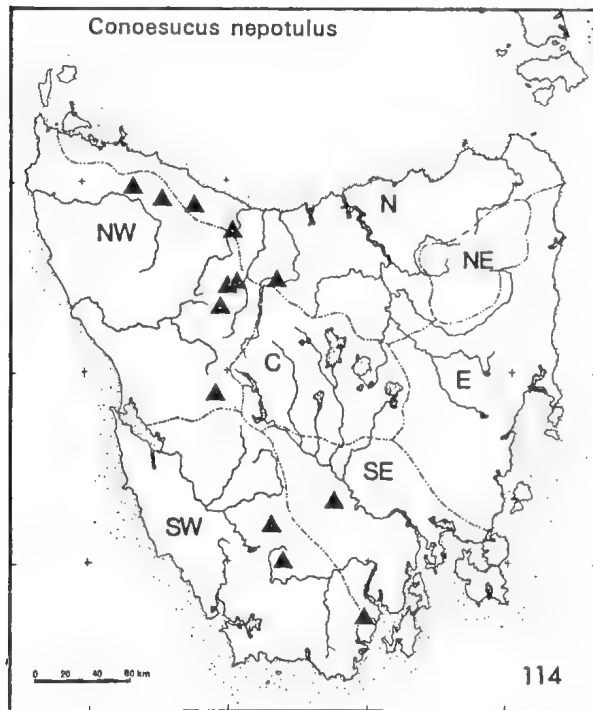
Greyish-brown to brown species. Anterior wings without longitudinal fold along R; Cu<sub>2</sub> ends at wing margin, and a short cross-vein near the apex connects it with Cu<sub>1</sub>b. Posterior wings

with Sc and R running separately to wing margin; fork 1 with footstalk. Maxillary palpi in male 3-segmented; segment 1 short, segment 2 about twice as long as segment 1, broad; segment 3 membranous, long, covered with long, dark hairs. Abdominal sternites without ventral processes in either sex.

♂ genitalia dorsally with elevated median projection on tergite 9, distal margin extended to a pair of slightly curved processes. Superior appendages short, rounded. Segment 10 formed by a pair of laterally flattened processes; distal ends turned upward at almost a right angle, tapered to triangular apices. Phallus broad, rounded apically. Inferior appendages short; a pair of long, slender processes arise from inner basal margin, curve up and protrude posteriorly on either side of phallus.

♀ abdomen terminates bluntly with mesal dome rather broad, ventral incision gradually widened posteriorly.

Length of anterior wing: ♂ 5-6.5 mm; ♀ 6-7 mm.



Type material: Holotype ♂ (T5285), allotype ♀ (T5286), 15 ♂ 15 ♀ paratypes (T5287-T5316) Dip River Falls, 10 km S of Mawbanna, Tas., 1 Dec. 1974, A. Neboiss (NMV).

Other material examined: Tasmania—14 ♂ 4 ♀ Guide River Falls nr. Ridgley, 18 Nov. 1972; 4 ♂ Dove River, Cradle Mtn. Nat. Park, 14 Dec. 1974; 1 ♂ Bull Creek, Cradle Mtn. Road, 13 Dec. 1974; 1 ♂ Mersey River trib. 4 km W Liena, 15 Dec. 1974; 1 ♂ Iris River trib. 15 km N of Cradle Mtn., 13 Dec. 1974; 1 ♂ Arrowsmith creek 18 km SW Derwent Bridge, 9 Dec. 1974; 4 ♂ 4 km E of Liena, small creek, 17 Nov. 1972; 1 ♂ Leven River nr. Heka, 17 Nov. 1972; 1 ♂ Flowerdale River, Meunna, 4 Nov. 1972; 2 ♂ Creekton River nr. Dover, 14 Nov. 1972; 1 ♂ Wedge River, 17 Feb. 1971; 1 ♂ Condominion Creek nr. Mt Eliza, 9 Feb. 1965; 1 ♂ 2 ♀ Russell Falls, Nat. Park, 23 Feb. 1967; 2 ♂ same loc., 20 Feb. 1971. All specimens collected by A. Neboiss (NMV). 2 ♂ Russell Falls, Nat. Park, 23 Feb. 1967, E. F. Riek (ANIC).

Distribution: Tasmania—N, NW, SW and SE provinces.

### 115 *Conoesucus brontensis* sp. n.

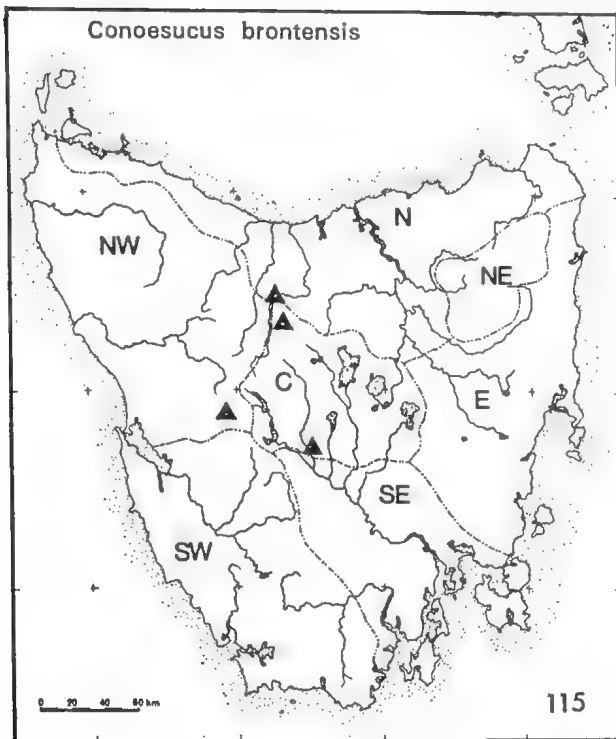
Figures 604-609

Anterior wings black, without longitudinal fold along R; Cu<sub>2</sub> ends at the wing margin, a short cross-vein near the apex connects it with Cu<sub>1b</sub>. Posterior wings with Sc and R running separately to wing margin; fork 1 sessile or at the most with very short footstalk. Maxillary palpi in male 3-segmented; segment 1 short, segment 2 about twice as long as segment 1, broad; segment 3 membranous, long, with short, sclerotized basal section, covered with long, dark hairs. Abdominal sternites without ventral processes in either sex.

♂ genitalia: segment 9 dorsally with elevated transversal ridge, produced posteriorly at the middle; distal margin extended to a pair of short, broad, curved processes. Superior appendages short, rounded. Segment 10 in form of two parallel, laterally flattened plates, distal ends curved upwards at almost a right angle, tapered apically. Phallus widened and rounded apically. Inferior appendages short, basal section of outer margin irregularly excised; a pair of long, slender processes arise from the inner basal margin, curve up and protrude posteriorly on either side of phallus; a small mesal projection on each process near the base.

♀ abdomen with small mesal dome, the median incision in ventral plate widened near its base.

Length of anterior wing: ♂ 7-8 mm; ♀ 8.5-10 mm.



**Type material:** Holotype ♂ (T5317), allotype ♀ (T5318), 11 ♂ 10 ♀ paratypes (T5319-T5339) 5 km W Bronte, small creek, Tas., 8 Nov. 1972, A. Neboiss (NMV).

**Other material examined:** Tasmania—3 ♂ Fisher River, Pencil Pine Grove below Lake McKenzie dam, 15 Dec. 1974; 15 ♂ 1 ♀ Collingwood River bridge, Lyell h-way, 9 Dec. 1974; 1 ♂ Mersey River nr. Liena, 16 Nov. 1972. All specimens collected by A. Neboiss (NMV).

**Distribution:** Tasmania—C, N and NW provinces.

## 18 Family ODONTOCERIDAE Wallengren (1891)

**Family diagnosis:** Ocelli absent. Antennae longer than the anterior wings, basal segment large, second segment small. Maxillary palpi long and stout, five-segmented. Wing venation sometimes irregular in males, often differing from that in the females. Discoidal cell present and closed in both wings; median cell absent. Mesoscutum with mesal line only faintly indicated; scutellum round and distinctly dome-shaped, the wart appears to occupy most of the sclerite.

Spurs 2:4:4.

In Tasmania there is only one confirmed

genus with a single species. In addition, Mosely and Kimmins (1953:165) doubtfully refer to a single male form Deloraine as being close to *Marilia bola* Mosely. So far this species has not been confirmed. For the genus *Caloca* Mosely which was placed in this family (Mosely and Kimmins, 1953), a new family Calocidae was created by Ross (1967).

### Genus *Atriplectides* Mosely

*Atriplectides* Mosely, 1936a:119; Mosely and Kimmins, 1953:167; Jacquemart, 1965b:17.

**Type species:** *Atriplectides dubia* Mosely, 1936.

Anterior wings long and narrow; discoidal cell small in both wings; posterior wings with broad anal field, a row of short bristles along costal margin. Male genitalia with two-segmented inferior appendages.

Only one species in this genus.

## 116 *Atriplectides dubia* Mosely

Figures 610-614

*Atriplectides dubia* Mosely, 1936a:120; Mosely and Kimmins, 1953:168; Jacquemart, 1965b:17; Neboiss, 1974c:14.

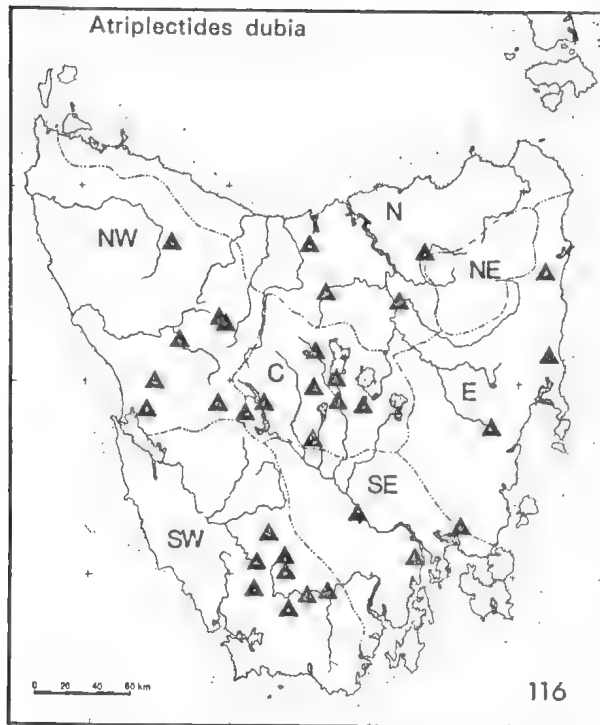
Wings dark fuscous, with dark, indistinct, irregular mottling. Basal half of the costal margin of posterior wing with a row of macrotrichia, distal ones slightly longer. Antennae slender, segment 1 somewhat bulbous, segment 2 very short, rounded, segment 3 and the subsequent ones long, cylindrical. Maxillary palpi with segment 1 short, segments 2 and 3 long and stout, segments 4 and 5 slender.

♂ genitalia with distal margin of segment 9 in lateral view produced into a broad, blunt, triangular projection; segment 10 short and broad, with apical angles extended laterally. Superior appendages short, broad, with sub-acute apices. Inferior appendages two-segmented; coxopodite long, slightly curved, wider posteriorly; harpago short, somewhat squarish, apex truncate with serrate ridge. Phallus stout, curved downwards.

♀ abdomen terminates bluntly with a pair of distally downturned, apically rounded dorsal plates, separated in the middle by deep cleft; a small outer lobe on either side.

**Length of anterior wing:** ♂ 10-12.5 mm; ♀ 12-13 mm.





*Type material:* Type ♂ Great Lake, Miena, Tas., Jan. 1931, C. Parker (BMNH). Type not seen.

*Material examined:* Tasmania—1 ♂ 3 ♀ Miena, 3400 ft, 24 Jan. 1961, L. Couchman; 1 ♂ Lagoon of Islands, 5 Dec. 1974; 1 ♂ 1 ♀ Bradys Lake, 9 Dec. 1974; 12 ♂ Derwent River 2 km NW of Derwent Bridge, 12 Feb. 1971; 1 ♀ Franklin River 20 km SW of Derwent Bridge, 11 Feb. 1971; 1 ♂ 2 ♀ Henty River 12 km NW of Queenstown, 10 Feb. 1971; 5 ♀ Hellyer River Gorge, 9 Feb. 1971; 5 ♀ Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971; 8 ♂ 4 ♀ Lake Pedder, 31 Jan. 1965; 5 ♂ 16 ♀ same loc., 1 Feb. 1965; 3 ♂ 3 ♀ Condominion Creek, 15 Feb. 1971; 6 ♀ Huon River Crossing, 8 Feb. 1965; 1 ♂ 3 ♀ same loc., 16 Dec. 1971; 1 ♂ 1 ♀ Junction Creek, West Arthur Plains, 7 Feb. 1965; 2 ♂ 2 ♀ Wedge River, 17 Feb. 1971; 2 ♂ 1 ♀ Huon River nr. Blakes Opening, 9 Feb. 1966; 7 ♂ 5 ♀ Huon-Picton River junction, 18 Feb. 1967; 1 ♀ Cracroft River, 8 Feb. 1966; 1 ♀ Apsley River, Bicheno, 9 Nov. 1972; 1 ♀ Scamander River, Upper Scamander, 9 Nov. 1972; 1 ♀ St. Patricks River, Targa, 22 Feb. 1971; 1 ♂ 8 ♀ South Esk River, Evandale, 1 Mar. 1967; 3 ♀ Rubicon River 8 km SE of Sassafras, 2 Dec. 1974; 1 ♀ Bushy Park, 23 Feb. 1967; 1 ♀ Sorell River 3 km N of Sorell, 8 Dec. 1974; 1 ♂ Tooms Lake, 4 Dec. 1974. All specimens collected by A. Neboiss unless otherwise stated (NMV).

2 ♀ Murchison River, 5 Feb. 1967; 1 ♂ Howe Lagoon nr. Lake Augusta, 29 Jan. 1966; 1 ♀ 10 mls E Strahan, 6 Feb. 1967; 1 ♂ Derwent Bridge, 12 Feb. 1967; 2 ♂ 2 ♀ Bushy Park, 23 Feb. 1967; 7 ♂ 8 ♀ Huon-Picton junction, 17 Feb. 1967; 1 ♀ Franklin River, 10 Feb. 1967; 1 ♀ Little Pine Lagoon, 16 Feb. 1967; 1 ♂ 5 ♀ Navarre River, 12 Feb. 1967;

4 ♀ Hellyer Gorge, 2 Feb. 1967; 1 ♂ Lake Dove, Cradle Mtn., 30 Jan. 1967. All specimens of the above group were collected by E. F. Riek (ANIC).

Victoria—from numerous southern and eastern localities.

Other recorded localities: Penstock, Cradle Mtn. Lake Lilla, Hobart, Deloraine.

*Distribution:* Tasmania—all provinces except NE; Victoria.

## 19 Family CALAMOCERATIDAE Ulmer (1906)

*Family diagnosis:* Ocelli absent. Antennae longer than the anterior wings, first segment thick, shorter than head. Maxillary palpi 5- or 6-segmented, hairy, terminal segment simple. Mesoscutum with two longitudinal lines of setiferous punctures, scutellum small, squarish. Anterior wing usually broad, somewhat triangular. Discoidal, median and thyridial cells always present and closed; venation alike in both sexes; forks 1, 2, 3, 4 and 5 present. Posterior wings with discoidal cell open or closed, median cell open.

Spurs 2:4:2, 2:4:3 or 2:4:4, those on the anterior tibia short.

Only one genus *Anisocentropus* in Australia, which is found also in Tasmania.

### Genus *Anisocentropus* McLachlan

*Anisocentropus* McLachlan, 1863:492; Ulmer 1907: 118; Ulmer, 1929:167; Ulmer, 1951:348; Mosely and Kimmins, 1953:171.

*Type species Anisocentropus illustris* McLachlan, 1863.

Antennae long, filiform, basal segment short, bulbous, segment 2 short, rounded. Maxillary palpi long, hairy, six-segmented and similar in both sexes. Head dorsally with large postero-lateral warts. Mesoscutum and scutellum flattened dorsally. Wings densely covered with short pubescence. Posterior tibia and tarsi with fringe of long hairs.

Spurs 2:4:3.

There is only one species recorded from Tasmania.

Following the discovery that *bicoloratus* Martynov is not synonymous with *latifascia* Walker as previously considered by Mosely and Kimmins, a description and figures of *bi-*



*coloratus* have been included to illustrate the differences.

### 117 *Anisocentropus latifascia* (Walker)

Figures 615-621

*Notidobia latifascia* Walker, 1852:90.

*Goera elegans* Walker, 1852:95.

*Anisocentropus latifascia*, McLachlan, 1863:495; Ulmer, 1906:54; Ulmer, 1929:168; Betten and Mosely, 1940:39; Mosely and Kimmins, 1953:172; Kimmins, 1958:167; Fisher, 1965:5; 1972:45.

Anterior wings densely covered with tawny or yellowish pubescence, either with more or less distinct oblique dark brown band across the middle of the wing, or bicolorous with yellowish basal and dark brown apical half. In latter case the wing membrane at the basal section also is yellow.

♂ genitalia with segment 10 broad, bent downwards, apical margin bearing a row of short spines, excised in the middle, apical angles extended to a rounded lateral lobe with a ventral claw-like process. Superior appendages stout, slightly clavate. Inferior appendages very short, either truncate or somewhat rounded apically in lateral view, inner surface covered with a group of short, stout spines.

♀ abdomen terminates bluntly with a pair of broad, rounded dorsal lobes; apical margin of tergite 9 more or less evenly rounded, not produced into a median projection; sternite 9 with narrow, triangular apical lobes; dorsal pigmented line broadly V-shaped. Sternite 8 with mid-ventral incision short and broad. Other details as figured.

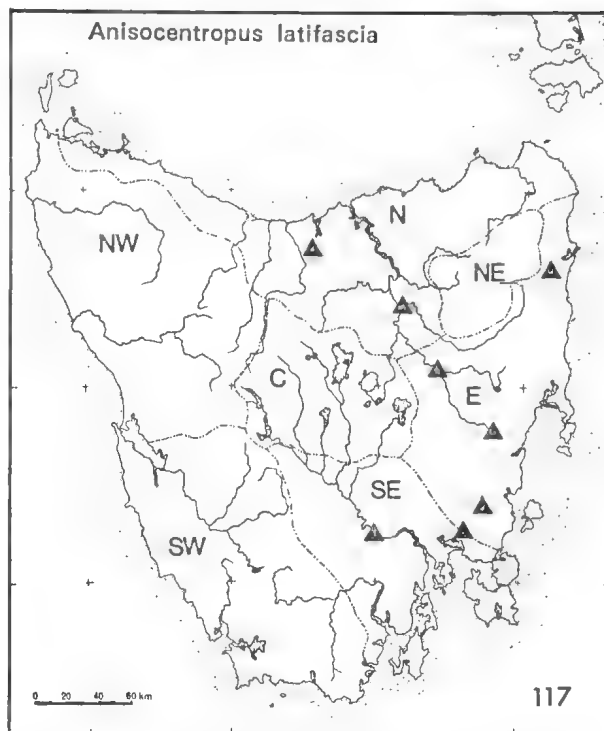
Length of anterior wing: ♂ 9-10.5 mm; ♀ 10-12 mm.

*Type material*: Type ♂ (BMNH) without locality label, but erroneously described as coming from 'North America'. Type seen.

Type ♂ of *Goera elegans* Walker (BMNH) without locality, but also described as being from '? North America'. Type seen.

The history of the two types and their identity have been discussed in detail by Kimmins (1958). In Victoria and New South Wales *latifascia* occasionally has been recorded from the same localities as *bicoloratus*.

*Material examined*: Tasmania—1 ♂ 1 ♀ Macquarie River nr. Campbell Town, 9 Nov. 1972; 1 ♂ 1 ♀ Scamander River, Upper Scamander, 9 Nov. 1972; 3 ♀



South Esk River nr. Evandale, 1 Mar. 1967; 1 ♀ Tooms Lake, 4 Dec. 1974; 1 ♀ Sorell River 3 km N of Sorell, 8 Dec. 1974; 2 ♂ Prosser river 2 km W of Buckland, 7 Dec. 1974; 1 ♂ 3 ♀ Rubicon River 8 km SE of Sassafras, 2 Dec. 1974; 13 ♂ 1 ♀ Derwent River 3 km W of New Norfolk, 7 Dec. 1974. All specimens collected by A. Neboiss (NMV). 6 ♀ Evandale, 1 Mar. 1967, E. F. Riek (ANIC). Victoria—12 ♂ 5 ♀ Moorabool River, Meredith, 12 Feb. 1959, A. Neboiss (NMV); 7 ♂ 7 ♀ Lake Barracoota, 28 Jan. 1975, A. Neboiss (NMV); 1 ♂ 1 ♀ Murray River, Irymple, 25 Nov. 1964, A. Neboiss (NMV). New South Wales—1 ♂ 4 ♀ Batemans Bay, 18 Feb. 1958, E. F. Riek (ANIC); 1 ♂ Canberra, A.C.T., 10 Mar. 1958, E. F. Riek (ANIC).

*Distribution*: Tasmania—N, E and SE provinces; Victoria; New South Wales.

### *Anisocentropus bicoloratus* (Martynov)

Figures 622-626

*Ganonema bicolorata* Martynov, 1914:132.

*Anisocentropus latifascia*, Mosely and Kimmins, 1953:172; Fisher, 1972:45.

*Anisocentropus bicoloratus*, Fisher, 1965:3.

Mosely and Kimmins (1953), without examining the type specimen, considered that 'Martynov's *Ganonema bicolorata* is almost certainly a synonym' of *Anisocentropus latifascia* Walker. Later Kimmins (1958) analysed the types of *latifascia* and *elegans*, and recorded the intention by Riek to describe a new species

of *Anisocentropus* from New South Wales, but this has not been done to date.

The examination of the type female of *Ganonema bicolorata* Martynov by the present author, clearly indicated that this species is not synonymous with *latifascia*, but agrees with specimens found in Victoria and New South Wales.

All specimens so far examined and identified as *bicoloratus*, have distinctly bicoloured wings, the divisional line between the two colours being almost straight. The bright yellowish colour of the basal half of the wing includes the pubescence and part of the wing membrane, extending to all thoracic segments. The intensity of dark brown colouring of the apical half of the wing varies considerably.

♂ genitalia of the same general plan as that in *latifascia*, but differing mainly in the shape of the inferior appendages, which are short, triangular in lateral view; inner margin produced distally to a short digitiform process.

♀ abdomen terminates with a pair of rounded dorsal lobes; apical margin of tergite 9 extends to an elevated median projection; dorsal pigmented line curved; apical lobes of sternite 9 short, truncate, usually darkly pigmented. Sternite 8 with mid-ventral incision long, tapering anteriorly.

Length of anterior wing: ♂ 9-10.5 mm; ♀ 9.5-11.5 mm.

Type material: Type ♀ (Leningrad Museum) 'Nov. Holl.' without exact locality. Type seen.

Material examined: Victoria—30 ♂ 14 ♀ Yarra River, Warrandyte, 27 Feb. 1954; 1 ♂ Kangaroo Ground, 27 Dec. 1954; 4 ♂ 3 ♀ Moorabool River, Meredith, 12 Feb. 1959; 2 ♂ 4 ♀ Buffalo River, Abbeystead, 27 Jan. 1960; 2 ♂ 22 ♀ Gibbo River and Morass Creek junct., 1 Feb. 1974. All specimens collected by A. Neboiss (NMV). New South Wales—1 ♂ 2 ♀ Minna Murray Falls, 16 Nov. 1960, I. F. B. Common (ANIC); 1 ♂ 1 ♀ Styx River 12 km S of Ebor, 17 Oct. 1973, A. Neboiss (NMV); 1 ♂ 3 ♀ Condor Creek, A.C.T., 5 Feb. 1958, E. F. Riek (ANIC); 1 ♂ 2 ♀ Kangaroo Valley, 22 Mar. 1961, E. F. Riek (ANIC).

Distribution: Victoria, New South Wales.

## 20 Family PHILORHEITHRIDAE Mosely (1936)

Family diagnosis: Ocelli absent. Antennae about as long or longer than the anterior wings in males, slightly shorter in females; first segment

large, thickened, second segment small, usually about as long as wide. Maxillary palpi usually 5-segmented in both sexes, but segmentation reduced in males of some genera; first segment with a nodule on the mesal surface near apex. A pair of slender, upturned, single segmented, finger-like processes or pilifers on the frons of males in most genera. In anterior wings  $R_1$  joins  $R_2$  shortly before the wing margin; an oval sclerotized area on the anal margin, which sometimes is extended into a more or less distinct lobe. Discoidal cell present and closed in both pairs of wings; it can also be seen in wings with a longitudinal fold (males of genus *Aust-rheithrus*).

Spurs 2:4:4.

The family is known to occur in Australia with a few genera in New Zealand (Wise 1973) and South America (Schmid 1955b). The main area of distribution nevertheless lies in eastern Australia, where it is well represented in areas with cool, flowing water. The larvae construct slightly curved cylindrical cases made from coarse sand grains.

### KEY TO TASMANIAN GENERA

1. Scutellum with pair of distinct warts . . . 3
- Scutellum without warts, at most with setiferous punctures . . . . . 2
2. Mesoscutum with two rows of setiferous punctures (diverging posteriorly); pronotum with two pairs of warts *Tasmanthrus*
- Mesoscutum with or without warts, pronotum with a pair of warts only . . . . . *Aust-rheithrus*
3. Scutellum with warts very small, less than half the longitudinal diameter of those on mesoscutum . . . . . *Kos-rheithrus*
- Scutellum with warts of similar size or only slightly smaller than those on mesoscutum . . . . . 4
4. Anterior wing with sclerotized area of anal margin produced to a distinct lobe. Males without pilifers, antennae with segments 3 to 16 pectinate . . . . . *Rami-rheithrus*
- Anterior wing with sclerotized area of anal margin not produced to a distinct lobe; males with pilifers, antennae not pectinate . . . . . *Aphilor-rheithrus*

Several very interesting morphological structures are found in this family. The males in some genera have a pair of single segmented, slightly curved cylindrical processes or pilifers in front of the face. It is believed that they function as scent-organs. Of the five Tasmanian genera, two—*Austrheithrus* and *Ramiheithrus*—do not possess the pilifers.

Antennal segments, particularly the first 10 or 15 in males, are often either modified or bear special hairs, such as groups of conspicuous long hairs, setae or papillae; modifications of the shape of the first segment are also found. Some of the subsequent segments may be pectinate—as in genus *Ramiheithrus*, or with excisions as in *Austrheithrus* and *Kosrheithrus*.

The position and shape of warts found on the head, pronotum, mesoscutum and scutellum are varied and are important characters in taxonomic analysis. Usually those of the mesoscutum and scutellum have been used in family level, but within Philorheithridae they differ not only between genera but even between species.

In the anterior wings, some variation occurs in the position of anal veins, and comparative work shows that  $A_2$  is always present, whereas  $A_1$  is often either absent, or present in part only, while  $A_3$  is usually very short. Between the anal veins and wing margin in males of some species is a longitudinal blind vein, which starts in the vicinity of the sclerotized area and ends shortly before the arculus; sometimes it forms a groove which is covered with long, dense hairs (*Tasmanthrus*).

The tracheal openings on sternites 2 to 7 are each connected to the anterior and posterior margins of the sternites by a more or less distinct dark line.

### Genus *Austrheithrus* Mosely

*Austrheithrus* Mosely in Mosely and Kimmins, 1953: 190.

*Type species: Austrheithrus dubitans* Mosely, 1953.

Maxillary palpi in male 3-segmented; segment 1 very short, segments 2 and 3 long and slender; labial palpi 3-segmented, slightly longer than maxillary palpi; pilifers absent. In female, maxillary palpi normal, 5-segmented, longer than labial palpi. Head dorsally with two

pairs of warts, the anterior pair small, between or slightly basad of the bases of the antennae, close to the median suture; posterolateral warts large, more or less elongate oval. Pronotum with lateral warts only; mesoscutum with or without warts according to species; scutellum without warts.

Anterior wings in male with a longitudinal fold along the middle of the wing;  $R_1$  joins  $R_2$  shortly before the wing margin in females, but in males it varies according to species; discoidal cell present in both wings and both sexes, although often obscured in the anterior wings of males by the fold. Sclerotized area on the anal margin extended to a narrow lobe. In posterior wings  $R_1$  ends separately from  $R_2$  at the wing margin.

Two species recorded from Tasmania.

### KEY FOR SEPARATING TASMANIAN SPECIES

1. Mesoscutum without warts; male antennal segments 4 to 7, each with mesal excavation . . . . . *glymma*
- Mesoscutum with a pair of distinct warts; male antennal segments 4 to 7 without excavations . . . . . *ronewa*

### 118 *Austrheithrus ronewa* Mosely

Figures 627-632

*Austrheithrus ronewa* Mosely in Mosely and Kimmins, 1953:192.

This species is distinguished from *Austrheithrus glymma* by having a pair of distinct mesoscutal warts.

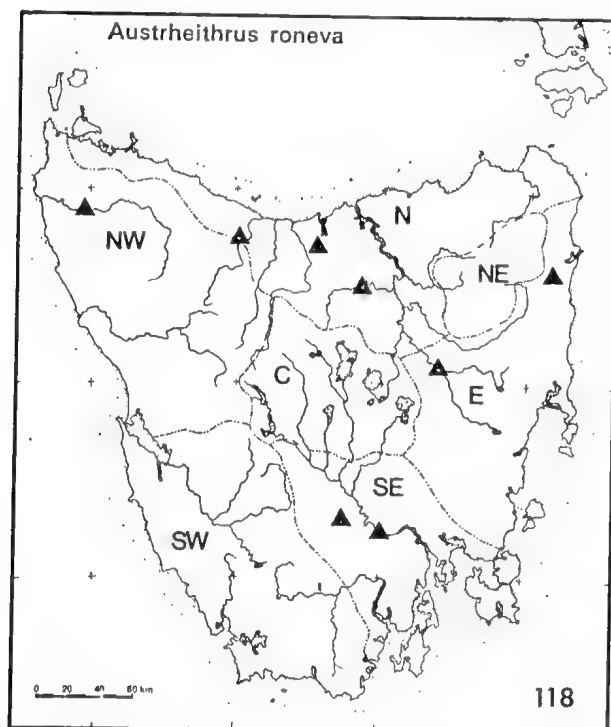
The first antennal segment long, longer than head, upper mesal margin widened in male, normal in female; segment 2 very short, segment 3 more than twice the length of second; the subsequent ones cylindrical. Head dorsally with distinct median suture; a pair of small anterior warts situated between bases of antennae; the large posterolateral warts elongate oval, slightly curved; basal margin of the head with small, pale spot on either side of median suture. Pronotum with a pair of rounded lateral warts only; the mesoscutal warts elongate oval, very close together and located anteriorly of the middle.

Anterior wings apparently with  $A_1$  absent;  $A_2$  and  $A_3$  separated for a very short distance near the base only; an oblique cross-vein between Cu and A, which in female resembles  $A_1$  by its situation. The cross-vein closing a small cell containing nygma in the female anterior wing, as figured by Mosely and Kimmins (1953 fig. 129 ♀), appears to be an exception. Among all the specimens examined from Tasmania and Victoria only three had this cell closed.

♂ genitalia with segment 10 short, formed by a pair of strongly downcurved plates, fused dorsally. Superior appendages moderately long, parallel, not clavate at the apices. Inferior appendages short, three branched, upper branch curved and tapered apically; centre branch the longest, broader at base, gradually tapers to rounded apex.

♀ abdomen terminates dorsally with a pair of subquadrate plates separated in the middle by narrow incision; sternite 8 with broad, U-shaped, darkly pigmented area.

Length of anterior wing: ♂ 10-12 mm; ♀ 12-14 mm.



Type material: Type ♂ Mt Kosciusko, N.S.W., 2700 ft., 22 Jan. 1885, McLachlan Collection (BMNH); 1 ♂ paratype New Norfolk, Tas.,

Mar. 1935; 1 ♀ paratype no locality, Nov. 1938, J. W. Evans (BMNH). Types not seen.

Material examined: Tasmania—10 ♂ 16 ♀ Leven River nr. Heka, 17 Nov. 1972; 2 ♂ Macquarie River 8 km W of Campbell Town, 9 Nov. 1972; 7 ♂ 7 ♀ Scamander River, Upper Scamander, 9 Nov. 1972; 1 ♂ Arthur River bridge 15 km SW of Roger River, 29 Nov. 1974; 3 ♂ Meander River 3 km N of Westbury, 16 Dec. 1974; 1 ♀ Rubicon River 8 km SE of Sassafras, 2 Dec. 1974. All specimens collected by A. Neboiss (NMV). 1 ♂ Tyenna River, National Park, 6 Jan. 1971, E. Hamilton-Smith (NMV).

Victoria—5 ♂ 4 ♀ Mitta Mitta River 8 km NE Benambra, 5 Feb. 1974, A. Neboiss (NMV).

Distribution: Tasmania—NW, N, E and SE provinces; Victoria; New South Wales.

### 119 *Austrheithrus glymma* sp. n.

Figures 633-640

This species differs from *ronewa* by the absence of mesoscutal warts and mesally excavated antennal segments in male.

Head dorsally with anterior pair of warts round, and situated between the bases of antennae; posterolateral warts short, rounded. Mesoscutal warts usually absent, although there are some specimens known which have a pair of small, rounded warts in the middle. In males antennal segment 1 expanded dorsomesally, covered with long hairs on mesal surface, segment 2 short, segment 3 slightly longer, segments 4 to 7 excavated mesally.

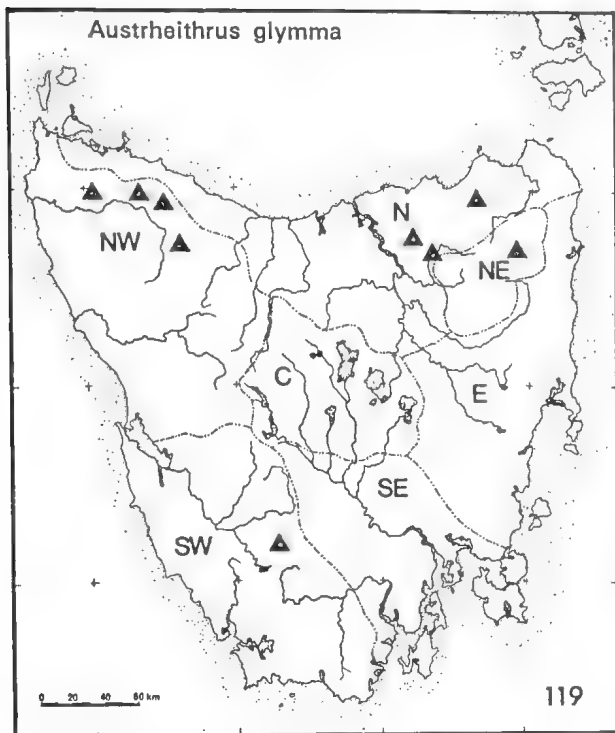
The position of anal veins in anterior wings of both sexes similar to that in *ronewa*. In male  $R_1$  does not join  $R_2$ , but terminates at the wing margin.

♂ genitalia of similar pattern to that in *ronewa*, but the superior appendages are clavate. Inferior appendages short, three-branched, upper branch curved and broadly spatulate apically, centre branch in lateral view narrow at base, broader apically.

♀ abdomen terminates with a pair of angular dorsal plates, separated by broad central incision.

Length of anterior wing: ♂ 10-12 mm; ♀ 11-13 mm.

Type material: Holotype ♂ (T5340), allotype ♀ (T5341) 5 ♂ 5 ♀ paratypes (T5342-T5351) St. Patricks River, Targa, Tas., 22 Feb. 1971, A. Neboiss (NMV).



*Other material examined:* Tasmania—3 ♂ 3 ♀ St. Columba Falls, Pyengana, 21 Feb. 1971; 12 ♂ St. Patricks River, Targa, 22 Feb. 1971; 13 ♂ 9 ♀ Grt. Forester River 5 km NW of Forester, 11 Nov. 1972; 1 ♂ 1 ♀ Lilydale, a creek 2 km N, 16 Dec. 1974; 1 ♂ Flowerdale River, Meunna, 4 Nov. 1972; 4 ♂ 1 ♀ Dip River Falls, 1 Dec. 1974; 20 ♂ 5 ♀ Duck River 6 km SW of Roger River, 29 Nov. 1974; 2 ♂ 7 ♀ Hellyer River Gorge, 9 Feb. 1971; 1 ♂ Wedge River, 17 Feb. 1971. All specimens collected by A. Neboiss (NMV). 1 ♂ Hellyer Gorge, 4 Feb. 1967, E. F. Riek (ANIC).

*Distribution:* Tasmania—N, NE, NW and SW provinces.

### Genus *Kosrheithrus* Mosely

*Kosrheithrus* Mosely in Mosely and Kimmins, 1953: 195.

*Type species:* *Kosrheithrus tillyardi* Mosely, 1953.

The genus can be immediately recognized by the elongate oval, mesoscutal warts and the very small, round warts on scutellum, which are less than half the longitudinal diameter of mesoscutal warts, and are situated anteriorly of the middle.

Maxillary palpi 5-segmented in both sexes; pilifers in the male present. Antennae in the male with upper surface of the first segment produced into a more or less distinct, apically pointed plate; segment 2 small, segment 3 ex-

vated mesally. Head dorsally with a pair of small, rounded anterior warts, situated between the bases of antennae; posterolateral warts large, oval.

Anterior wings apically rounded in male, somewhat elongate in female.  $R_1$  joins  $R_2$  in both sexes and both wings. Sclerotized area on anal margin of anterior wing produced into a distinct lobe.

Only one species known from Tasmania.

### 120 *Kosrheithrus remulus* sp. n.

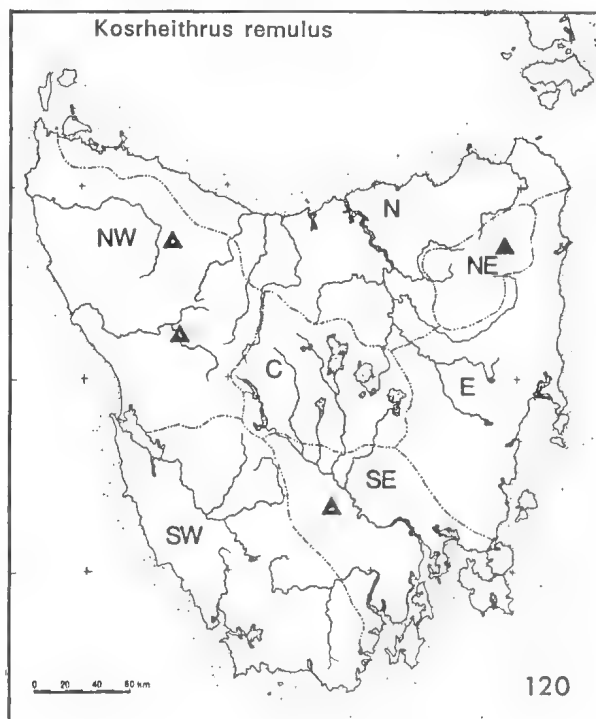
Figures 641-646

Dark, greyish-brown species, but smaller than *tillyardi* from New South Wales and Victoria.

♂ genitalia with segment 9 hood-shaped, terminating with a pair of broad plates which are separated in the middle by a deep excision. Segment 10 is situated below segment 9, has distal angles produced into apically rounded divergent lobes, the middle of dorsal surface raised to a high triangular crest. Phallus straight, slightly narrowed apically. Inferior appendages short and broad, fused ventrally.

♀ unknown.

*Length of anterior wing:* ♂ 10.5-12.5 mm.



*Type material:* Holotype ♂ (T5352), 1 ♂ paratype (T5353), National Park, Russell Falls, Tas., 23 Feb. 1967, A. Neboiss (NMV); 1 ♂ paratype (T5354) same loc., 19 Feb. 1971, A. Neboiss (NMV); 2 ♂ paratypes (T5355-T5356) same loc., 5 Dec. 1972, P. Zwick (NMV); 4 ♂ paratypes same loc., 16 Jan. 1965, E. F. Riek (ANIC).

*Other material examined:* Tasmania—2 ♂ Hellyer River Gorge, 9 Feb. 1971, A. Neboiss (NMV); 1 ♂ same loc., 12 Dec. 1974, A. Neboiss (NMV); 1 ♂ St. Columba Falls, Pyengana, 21 Feb. 1971, A. Neboiss (NMV); 4 ♂ Murchison River, 5 Feb. 1967, E. F. Riek (ANIC); 1 ♂ Hellyer Gorge, 4 Feb. 1967, E. F. Riek (ANIC).

*Distribution:* Tasmania—NE, SE and NW provinces.

### Genus *Ramiheithrus* Neboiss

*Ramiheithrus* Neboiss, 1974d:322.

*Type species:* *Ramiheithrus virgatus* Neboiss, 1974.

Antennae about as long as anterior wing, basal segments 3 to 16 pectinate in male, branches becoming shorter distally; the segments of apical half simple. Maxillary palpi 5-segmented in male; pilifers absent. Mesoscutum and scutellum each with a pair of rounded warts. Anterior wing without longitudinal fold, apex broad, obliquely truncate; sclerotized area on the anal margin produced to a rounded lobe. Posterior wing with Sc fused with R<sub>1</sub> for a short distance, then separating; Sc terminates into wing margin, R<sub>1</sub> joins R<sub>2</sub> shortly before wing margin.

Only one species in Tasmania.

#### 121 *Ramiheithrus kocinus* Neboiss

Figures 647-652

*Ramiheithrus kocinus* Neboiss, 1974d:323.

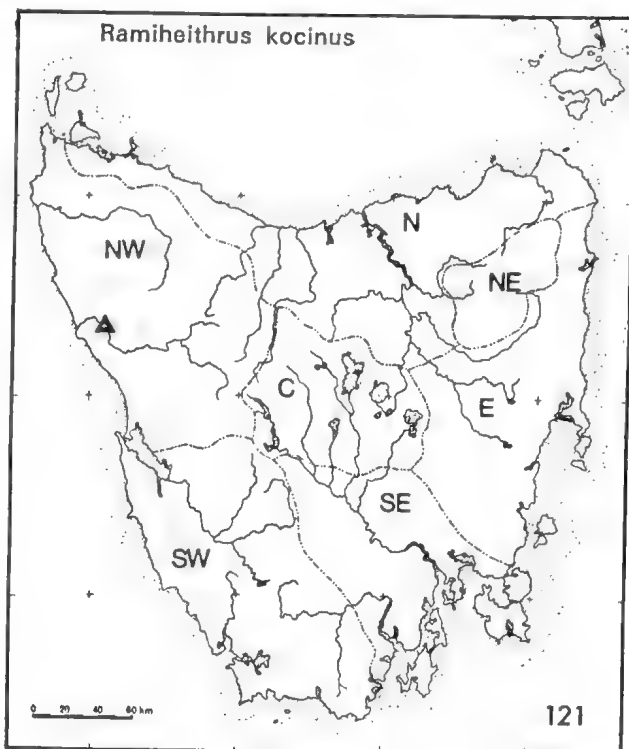
Blackish species with pale, irregular mottling on anterior wings. Head dorsally with a pair of rounded anterior warts, situated posteriorly at the bases of antennae; posterolateral warts somewhat reniform; pronotum with two pairs of warts.

♂ genitalia with segment 9 dorsally produced into a large, deeply cleft hood, the inner surface of each side covered with short spines. Segment 10 in form of trilobed, hood-like plate above phallus; the median lobe broad, semi-

circular, shorter than lateral lobes. Phallus broad, apex rounded. Inferior appendages fused ventrally and appear as broad, bilobed plate.

♀ unknown.

*Length of anterior wing:* ♂ 9 mm.



*Type material:* Holotype ♂ and 1 ♂ paratype Corinna, Tas. (small creek in forest), 5 Nov. 1972; A. Neboiss and G. Kocins (NMV).

*Distribution:* Tasmania—NW province.

### Genus *Aphilorheithrus* Mosely

*Aphilorheithrus* Mosely, 1936a:417; Mosely and Kimmins, 1953:186.

*Type species:* *Aphilorheithrus stepheni* Mosely, 1936.

Maxillary palpi 5-segmented in both sexes, first segment short with well developed apical nodule, other segments slender; in male the pilifers present. Head dorsally with two pairs of warts; the anterior pair round, situated at about the middle of the head; posterolateral warts very large and occupying most of the posterior portion of the head. Pronotum with two pairs of warts. Mesoscutum with a pair of slightly oval warts which are only slightly larger than those of the scutellum.

Anterior wings without longitudinal fold in male;  $R_1$  joins  $R_2$  shortly before wing margin in both wings and both sexes. The first anal vein ( $A_1$ ) usually not developed;  $A_2$  long, well developed;  $A_3$  very short; an additional veinlet between the anal vein and wing margin. Sclerotized area well developed but not produced into a distinct lobe.

## KEY TO TASMANIAN SPECIES

(Males only)

1. Head with dorsal median sulcus narrow . . . . . 2
- Head with dorsal median sulcus broad and deep . . . . . *luteolus*
2. First anal vein in anterior wing present . . . . . *decoratus*
- First anal vein in anterior wing absent . . . . . 3
3. Tergite 9 in lateral view terminating with rounded apex . . . . . *pauillus*
- Tergite 9 in lateral view with apex produced downward into triangular keel . . . . . *stepheni*

122 *Aphilorheithrus stepheni* Mosely

Figures 653-657

*Aphilorheithrus stepheni* Mosely, 1936a:418; Mosely and Kimmins, 1953:188.

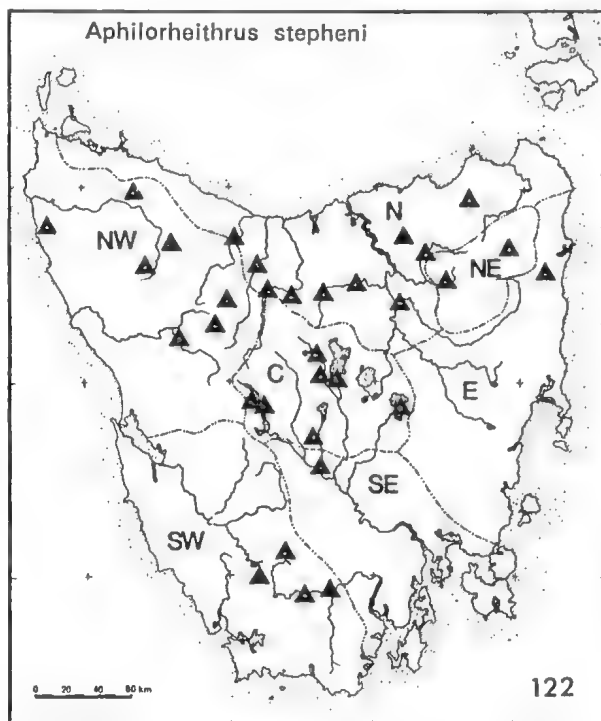
Detailed descriptions of this dark-brownish species are to be found in the previous publications cited and are not repeated here. It should only be added that warts on scutellum are situated posteriorly of the middle. Anterior wing with only rudimentary remains of first anal vein ( $A_1$ ) near the cross-vein Cu-A.

♂ genitalia with tergite 9 produced in a large, apically slightly cleft hood, the apex of which is produced ventrally into a pair of triangular keels. Segment 10 cleft apically. Phallus somewhat flattened dorsoventrally; in ventral view straight, rounded apically. Inferior appendages 2-segmented, coxopodite large, inner apical angle produced into a rounded projection; harpago small with several apical teeth. Small ventral process on sternite 7, slightly larger one on sternite 6.

♀ abdomen terminates with tergite 9 dorsally being developed into a pair of broadly triangular and apically truncate lobes, but the

ventral part appears as a pair of squarish plates. Sternite 9 in form of a short, broad and apically rounded plate.

Length of anterior wing: ♂ 12-14 mm; ♀ 13-17 mm.



Type material: Type ♂ Miena, 3300 ft., Tas., Dec. 1929, H. M. Stephen (BMNH). Type not seen.

Material examined: Tasmania—15 ♂ 10 ♀ Scamander River, Upper Scamander, 9 Nov. 1972; 2 ♂ 1 ♀ Grt. Forester River 5 km NW of Forester, 11 Nov. 1972; 4 ♂ 2 ♀ St. Patricks River, Targa, 22 Feb. 1971; 1 ♀ St. Columba Falls, Pyengana, 21 Feb. 1971; 21 ♂ 2 ♀ Lilydale, creek 2 km N, 16 Dec. 1974; 1 ♀ South Esk River, Evandale, 1 Mar. 1967; 1 ♂ 1 ♀ Meander River 3 km N of Westbury, 16 Dec. 1974; 6 ♂ 6 ♀ Hellyer River Gorge, 9 Feb. 1971; 16 ♂ 9 ♀ same loc., 12 Dec. 1974; 27 ♂ 3 ♀ Dip River Falls, 1 Dec. 1974; 1 ♂ Sundown Creek 25 km S of Marra-wah, 30 Nov. 1974; 17 ♂ 4 ♀ Lake Sorell, Interlaken, 5 Dec. 1974; 1 ♀ Western Lakes, Jan. 1962, R. Cooper; 1 ♀ Lake St. Clair, Derwent Basin, 6 Dec. 1974; 2 ♀ Derwent River 2 km NW Derwent Bridge, 12 Feb. 1971; 6 ♂ 1 ♀ Bradys Lake, 9 Dec. 1974; 1 ♂ Dee River 8 km NW of Ouse, 9 Dec. 1974; 2 ♂ Ouse River 8 km W of Miena, 5 Dec. 1974; 2 ♂ Iris River tributary 15 km N of Cradle Mtn., 13 Dec. 1974; 11 ♂ 3 ♀ Lake Lilla, Cradle Mtn. Nat. Park, 14 Dec. 1974; 7 ♂ Huon-Picton River junction, 18 Feb. 1967; 9 ♂ 3 ♀ same loc., 15 Nov. 1972; 1 ♂ 1 ♀ Huon River nr. Scotts Peak, 8 Feb. 1965; 1 ♂ Huon River nr. Blakes Opening, 9 Feb. 1966; 1 ♂ Huon River



Crossing, Port Davey track, 8 Feb. 1965; 1 ♂ same loc., 16 Feb. 1971; 10 ♂ 16 ♀ Mersey River, Liena, 16 Nov. 1972; 1 ♂ nr. Marakooa Caves, 15 Dec. 1974; 4 ♂ 2 ♀ Leven River nr. Heka, 17 Nov. 1972. All specimens collected by A. Neboiss unless stated otherwise (NMV). 3 ♂ 3 ♀ Murchison River, 5 Feb. 1967, E. F. Riek (ANIC); 19 ♂ 6 ♀ Forth Falls, 28 Jan. 1967, E. F. Riek (ANIC); 1 ♀ Iris River, Cradle Mtn. 2250 ft., 31 Jan. 1967, E. F. Riek (ANIC); 1 ♀ North Esk River, Waisloca, 12 Dec. 1959, D. Scholes (ANIC).

Victoria—7 ♂ 4 ♀ Gibbo River-Morass Creek junction, 1 Feb. 1974; 16 ♂ 7 ♀ Cobungra River, Anglers Rest, 4 Feb. 1974; 9 ♂ 2 ♀ Thomson River 1 km upstream. Cowwarr weir, 26 Oct. 1973. All specimens collected by A. Neboiss (NMV).

Other recorded localities; Tasmania—Deloraine, Waratah; New South Wales—Kiandra, Mt Kosciusko, Upper Murrumbidgee River.

*Distribution:* Tasmania—all provinces; Victoria; New South Wales.

### 123 *Aphilorheithrus pauxillus* sp. n.

Figures 658-661

Smaller and darker species than *A. stepheni*, but differs in some details.

Anterior wings with  $A_1$  joined to Cu for a short distance near the base, but distally it becomes untraceable soon after separating from Cu. In posterior wings  $R_s$  joins  $R_2$  before the cross-vein Sc-R. The arrangement of warts on the head, mesoscutum and scutellum is similar to that in *stepheni*.

♂ genitalia with tergite 9 narrowed to a deeply cleft apex, which is not produced ventrally. Segment 10 hood-shaped, apically truncate and cleft in the middle. Phallus slightly curved downward. Inferior appendages 2-segmented coxopodite long, distally with slightly expanded, inner apical angle, but not produced into a lobe; harpago small, clavate, apically covered with group of stout teeth. Small ventral process on sternite 6 and 7.

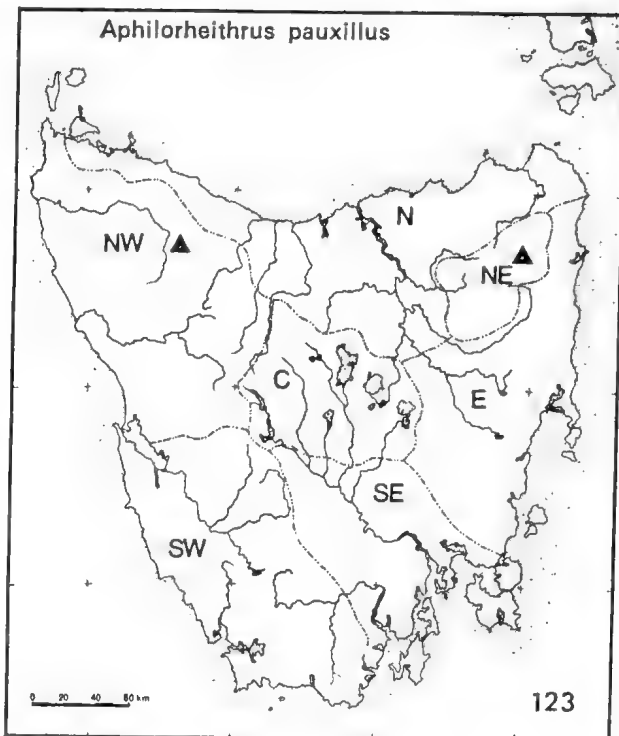
♀ unknown.

*Length of anterior wing:* ♂ 7.5-8 mm.

*Type material:* Holotype ♂ (T5357), 3 ♂ paratypes (T5358-T5360) St. Columba Falls, Pyengana, Tas., 21 Feb. 1971, A. Neboiss (NMV).

*Other material examined:* Tasmania—1 ♂ Hellyer River Gorge, 12 Dec. 1974, A. Neboiss (NMV).

*Distribution:* Tasmania—NE and NW provinces.



### 124 *Aphilorheithrus decoratus* sp. n.

Figures 622-666

This species has the most distinct, although irregular colour pattern on anterior wings of all the Tasmanian Philorheithridae. Particularly noticeable is the pale lunular area bordered with white and dark-brown at the apex of the wing.

The arrangement of warts on head, mesoscutum and scutellum is similar to that in *stepheni*. Anterior wings with  $A_1$  present except for a short distance between the cross-vein Cu-A and the base, where it is indistinct. Posterior wing with  $R_s$  joining  $R_2$  at the cross-vein Sc-R. There are no ventral processes on sternites 6 or 7 in either sex.

♂ genitalia with distal section of tergite 9 triangular, narrowly and deeply cleft, apices only slightly produced ventrally to rounded ridges. Segment 10 hood-shaped, triangular in ventral view, cleft apically. Phallus curved downward, dorso-ventrally flattened, apex truncate or slightly concave. Inferior appendages two-segmented, coxopodite slightly curved, widened in the middle, truncate apically; har-



pago round, curved inwards, apex truncate and minutely dentate.

♀ abdomen terminates with tergite 9 dorsally forming a pair of broad, apically truncate plates, separated in the middle by a broad basally rounded gap.

Length of anterior wing: ♂ 10-12 mm; ♀ 13-15 mm.

*Other material examined:* Tasmania—1 ♂ Hot Springs Creek, Hastings Caves, 14 Nov. 1972; 1 ♂ (teneral) Lake Pedder, 31 Jan. 1965; 1 ♂ (teneral) same loc., 1 Feb. 1965; 1 ♀ Corinna, 5 Nov. 1972 (ex pupa, teneral); 1 ♂ Hartz Mtn. area, Edwards Road, 7 Dec. 1972, P. Zwick. All specimens collected by A. Neboiss unless stated otherwise (NMV).

*Distribution:* Tasmania—NW and SW provinces.

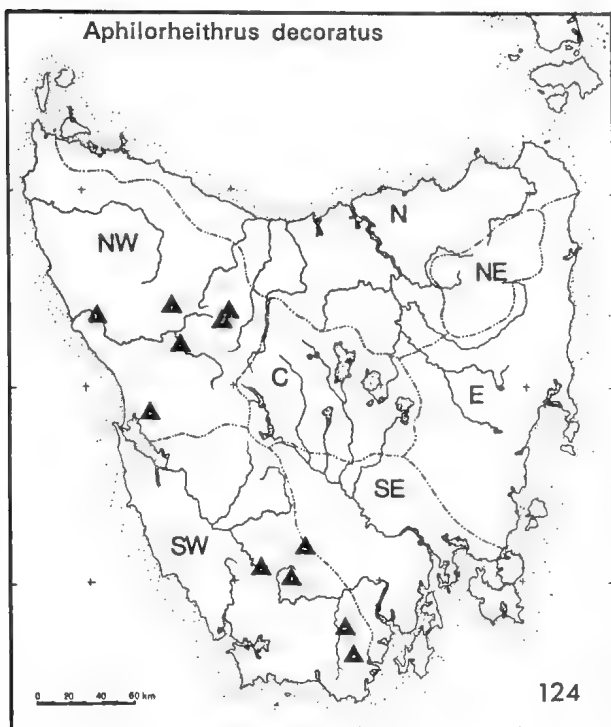
## 125 *Aphilorheithrus luteolus* sp. n.

Figures 667-672

Pale, yellowish-brown species. Anterior wing with  $A_1$  present at base but becomes untraceable before joining  $A_2$ . Lunular area at the apex of wing similar to that in *A. decoratus*. Posterior wing with  $R_1$  joining  $R_2$  at the cross-vein Sc-R.

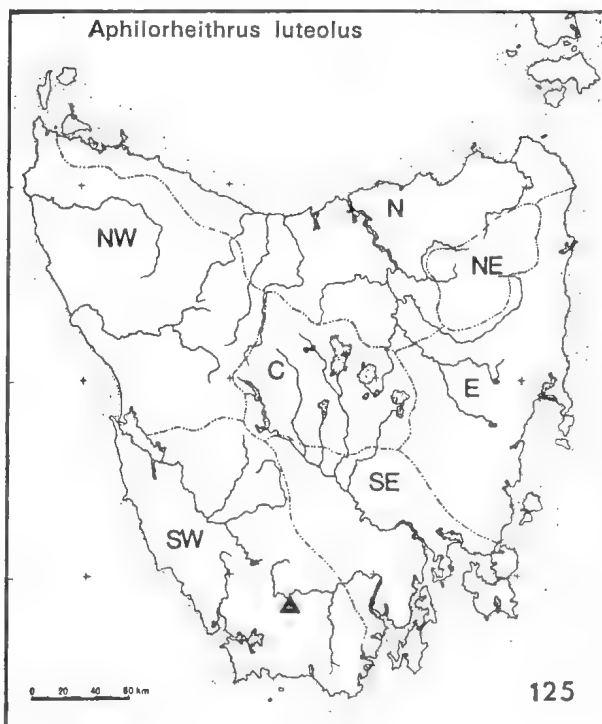
Head with broad and deep dorsal median sulcus; anterior warts rounded, situated at about the middle of the head; posterolateral warts large, curved, anterior end tapered to a narrow point. Pilifers present.

♂ genitalia with posterolateral angles of tergite 9 produced to acute points. Segment 10 appears as a broad, apically rounded hood, with a pair of elevated, triangular ridges dorsally near the apex. Phallus curved downwards, apex



*Type material:* Holotype ♂ (T5361), allotype ♀ (T5362), 1 ♂ 1 ♀ paratypes (T5363-T5364) Corinna, Tas., 5 Nov. 1972; 2 ♂ paratypes (T5365-T5366) Lake Pedder, Tas. 1 Feb. 1965; 2 ♂ paratypes (T5367-T5368) Con-dominion Creek, Tas., 15 Feb. 1971; 1 ♀ paratype (T5369) Farm Creek 4 km N of Tullah, Tas., 6 Nov. 1972; 1 ♂ paratype (T5370) Damper Inn, Port Davey track Mt Mueller area, Tas., 12 Feb. 1965; 1 ♂ paratype (T5371) Pencil Pine River 6 km N of Cradle Mtn., Tas., 13 Dec. 1974; 2 ♂ paratypes (T5372-T5373) Waldheim, Cradle Mtn. Nat. Park, Tas., 7 Feb. 1971. All specimens collected by A. Neboiss (NMV).

4 ♂ paratypes 10 mls E Strahan, 6 Feb. 1967, E. F. Riek (ANIC); 1 ♂ paratype Murchison River, 5 Feb. 1967, E. F. Riek (ANIC).



depressed dorsally. Inferior appendages 2-segmented; coxopodite long, apex truncate; harpago small, broad at base, narrowed distally and curved inwards, apex truncate and minutely dentate. Sternites 6 and 7 without ventral processes.

♀ slightly larger than male; anterior wings with similar colour pattern; genitalia not dissected.

*Length of anterior wing:* ♂ 13-13.5 mm; ♀ 15.5 mm.

*Type material:* Holotype ♂ (T5374), allotype ♀ (T5375), 2 ♂ paratypes (T5641-T5642) Cracroft River Tas., 8 Feb. 1966, A. Neboiss (NMV).

*Distribution:* Tasmania—SW province.

#### Genus *Tasmanthrus* Mosely

*Tasmanthrus* Mosely, 1936a:414; Mosely and Kimmins, 1953:183.

*Type species:* *Tasmanthrus angustipennis* Mosely, 1936.

Maxillary palpi in male 4-segmented, all segments modified, short, partly membraneous; pilifers present. In female maxillary palpi normal, 5-segmented. Antennae about as long as the anterior wing, segment 1 longer than head, stout; in male with longitudinal mesal lobe. Head dorsally with obliquely situated, somewhat rectangular posterolateral warts; anterior warts present only in female, sometimes partly or fully divided; absent in male, but instead there is a pair of membraneous papillae. Pronotum with two pairs of warts, the middle pair distinctly elevated. Mesoscutum with two rows of posteriorly diverging setiferous punctures in the middle; scutellum with a pair of setiferous punctures near the anterior margin; there are no warts on mesoscutum or scutellum.

Anterior wings with A<sub>1</sub> present, although sometimes absent or indistinct basally of cross-vein Cu-A in male; sclerotized area on the anal margin produced into a distinct, rounded lobe. R<sub>1</sub> joins R<sub>2</sub> shortly before wing margin in both wings and both sexes.

#### 126 *Tasmanthrus angustipennis* Mosely

Figures 673-682

*Tasmanthrus angustipennis* Mosely, 1936a:414; Mosely and Kimmins, 1953:183.

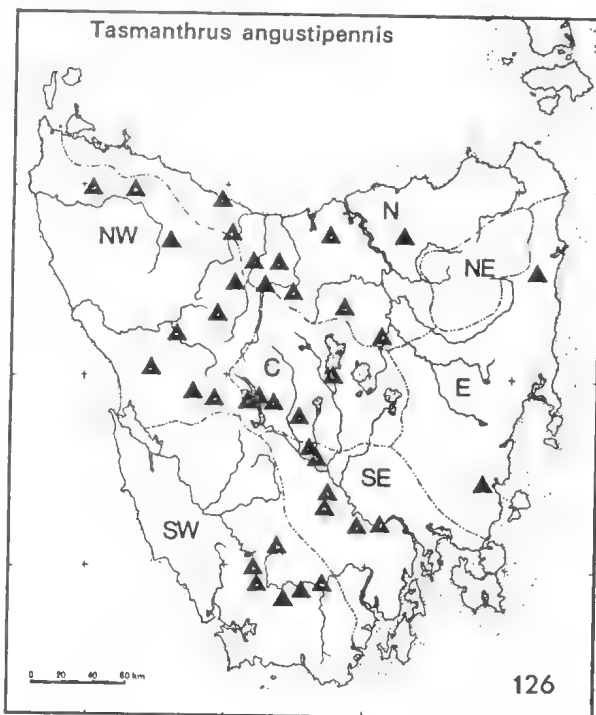
*Tasmanthrus galbinomaculatus* Jacquemart, 1965b:19 syn. nov.

The details described in the generic diagnosis refer entirely to this species as the only member of the genus. Ventral process on sternite 6 in both sexes very small, in males often entirely absent.

♂ genitalia with tergite 9 short, slightly produced in the middle; superior appendages large, broad at base, gradually tapering to rounded apices. Segment 10 formed by two plates joined in the middle. Phallus curved downward, visible from below only. Inferior appendages single segmented, two-branched; the upper branch directed upward and variable in shape, from a simple, upright, digitiform process to one with laterally dilated base; the lower branch dentate at the inner surface.

♀ abdomen terminates bluntly with apical margin of segment 9 excised at the middle to form small, somewhat triangular plates on either side.

*Length of anterior wing:* ♂ 9-11 mm; ♀ 12-14 mm.



*Type material:* Type ♂ Miena, Great Lake, Tas., Dec. 1930, C. Parker; ♀ paratype, same loc., Dec. 1929, H. M. Stephen (BMNH). Type not seen.

Holotype ♂ of *Tasmanthrus galbinomaculatus* Jacquemart, Cradle Mtn. Tas., 12 Jan. 1923, A. Tonnoir, dissected and mounted on three microscope slides (IRScNB). Of the three slides only the one with the abdomen could be used for identification; the head and legs on second slide are fragmentary and difficult to interpret; the wings of the third slide are lost and the cover glass has been reglued. It is therefore not possible to recheck the wing venation, which in the illustration (Jacquemart, 1965b fig. 15D and E) show numerous presumed errors. The male genitalia is similar to that of *angustipennis*, except that the upper branch of the inferior appendage has a distinct triangular lateral widening, whereas from other localities it is obtuse, rounded or almost absent. Due to this variability it is not considered to be sufficient for erection of a separate species and therefore *galbinomaculatus* is considered as synonym of *angustipennis*.

*Material examined:* Tasmania—26 ♂ 68 ♀ Scamander River, Upper Scamander, 9 Nov. 1972; 14 ♂ 21 ♀ Derwent River 2 km NW Derwent Bridge, 12 Feb. 1971; 11 ♂ 26 ♀ Franklin River 20 km SW Derwent Bridge, 11 Feb. 1971; 22 ♂ Leven River nr. Heka, 17 Nov. 1971; 26 ♂ 36 ♀ Mersey River nr. Liena, 16 Nov. 1972; 3 ♂ Minnow River nr. Paradise, 17 Nov. 1972; 3 ♂ Clarence River 9 km E of Derwent Bridge, 4 Dec. 1972, P. Zwick; 1 ♂ same loc., 4 Dec. 1974; 3 ♂ Ellendale, 4 Dec. 1972, P. Zwick; 1 ♀ Lake River 5 km SW Delmont, 9 Nov. 1972; 2 ♂ 2 ♀ National Park, 19 Feb. 1971; 1 ♂ Saxon Creek 10 km NW Frankford, 18 Nov. 1972; 1 ♀ Prosser River nr. Orford, 13 Nov. 1972; 2 ♂ 1 ♀ Sassafras Creek 4 km W of Mole Creek, 17 Nov. 1972; 39 ♂ 14 ♀ Hellyer River Gorge, 9 Feb. 1971; 7 ♂ 1 ♀ same loc., 5 Nov. 1972; 6 ♂ 1 ♀ same loc., 2 Dec. 1972, P. Zwick; 28 ♂ 4 ♀ same loc., 12 Dec. 1974; 1 ♂ 1 ♀ Henty River 12 km NW Queenstown, 10 Feb. 1971; 2 ♂ Mackintosh River, 3 Dec. 1972, P. Zwick; 1 ♂ Burnie, 18 Nov. 1972; 63 ♂ 8 ♀ Huon-Picton River junction, 18 Feb. 1967; 6 ♂ Cracroft River, 8 Feb. 1966; 1 ♂ 2 ♀ Huon River Crossing, 16 Feb. 1971; 1 ♀ West Arthur Plains, 6 Feb. 1965; 2 ♂ 3 ♀ Huon River nr. Scotts Peak, 8 Feb. 1965; 5 ♂ 2 ♀ Huon River nr. Blakes Opening, 9 Feb. 1966; 1 ♂ 1 ♀ Plenty River 6 km E of Moogara, 7 Dec. 1974; 4 ♂ Duck River 6 km SW of Roger River, 29 Nov. 1974; 1 ♂ Dip River Falls, 1 Dec. 1974; 1 ♂ Nive River 2 km W of Bronte, 5 Dec. 1974; 1 ♂ Murchison River 4 km S of Tullah, 12 Dec. 1974; 11 ♂ Lilydale, creek 2 km N, 16 Dec. 1974; 2 ♂ 2 ♀ Lake St. Clair, Derwent Basin, 6 Dec. 1974; 7 ♂ 3 ♀ Black Bobs Creek 15 km NW of Ouse, 9 Dec. 1974; 1 ♂ Collingwood River bridge, Lyell H-way, 9 Dec. 1974; 3 ♀ Liffey River 5 km W of Liffey, 2 Dec. 1974; 19 ♂ 5 ♀ Dee River 8 km NW of Ouse, 9 Dec. 1974; 1 ♂ Bull Creek, Cradle Mtn. Road, 13 Dec. 1974. All specimens col-

lected by A. Neboiss unless stated otherwise (NMV). 19 ♂ 42 ♀ Forth Falls, 28 Jan. 1967, E. F. Riek (ANIC); 5 ♂ 11 ♀ Franklin River, 10 Feb. 1967, E. F. Riek (ANIC); 32 ♂ 12 ♀ Hellyer Gorge, 4 Feb. 1967, E. F. Riek (ANIC); 4 ♂ 10 ♀ Murchison River, 5 Feb. 1967, E. F. Riek (ANIC).

*Other recorded localities:* Tasmania—New Norfolk.

*Distribution:* Tasmania—all except NE province.

## 21 Family LEPTOCERIDAE Leach (1815)

*Family diagnosis:* Ocelli absent. Anterior wings long, narrow, venation sometimes irregular in males; discoidal cell closed; median cell always absent. Posterior wings either narrow or wide, depending on species; discoidal cell closed in subfamily Triplectidinae, open in subfamily Leptocerinae; one or two short rows of curved macrotrichia or hamuli at about the middle of the costal margin. Antennae long and slender. Maxillary palpi slender, 5-segmented in both sexes, covered with dense hairs, segment 5 flexible. Mesoscutum and scutellum without warts.

This family is world-wide in distribution, although it is more prevalent in warmer regions. It occurs in a wide variety of habitats, from swift flowing mountain streams to warm, inland lakes and swamps. Larvae usually construct tubular cases of sand grains or pieces of organic material; some species use pieces of grass stems or hollow out small twigs. They pupate within the larval case which they attach firmly to an underwater substrate.

### KEY TO SUBFAMILIES OF LEPTOCERIDAE

1. Posterior wing with discoidal cell closed . . . . . *Triplectidinae*
- Posterior wing with discoidal cell open . . . . . *Leptocerinae*

### Subfamily TRIPLECTIDINAE Ulmer 1906

The subfamily is distinguished by the closed discoidal cell in posterior wings; other characters as described for the family.

# KEY FOR SEPARATING TASMANIAN GENERA

1. In anterior wing cross-vein closing discoidal cell concave; lower apical angle at cross-vein r-m more or less produced downwards towards the thyridial cell . . . . . 2
- In anterior wing the cross-vein closing discoidal cell straight; lower apical angle at cross-vein r-m not produced downwards . . . . . 3
2. Posterior wing — fork 1 present . . . . . *Triplectides*
- Posterior wing — fork 1 absent . . . . . *Westriplectes*
3. Spurs 2:2:2 . . . . . *Symphitoneuria*
- Spurs 2:2:4 . . . . . 4
4. Cross-vein r-m in both pairs of wings either directly, or nearly directly below the cross-vein closing discoidal cell; venation in the male anterior wing normal . . . . . 5
- Cross-vein r-m at least its own length basad or cross-vein closing discoidal cell; venation in male anterior wing modified . . . . . 6
5. In posterior wing fork 1 absent, or if present, then very narrow, indistinct; inferior appendages in male genitalia without the large, strong slightly curved middle branch . . . . . *Notalina*
- In posterior wing fork 1 distinct; inferior appendages with large, curved middle branch . . . . . *Notoperata*
6. In anterior wing in males fork 1 with footstalk, thickening of veins below discoidal cell short; in females thyridial cell longer than discoidal cell . . . . . *Triplectidina*
- Anterior wing in males with fork 1 sessile, thickening of veins below discoidal cell long; in females thyridial cell shorter than discoidal cell . . . . . *Lectrides*

## Genus *Westriplectes* gen. n.

Type species *Westriplectes pedderensis* gen. et sp. n.

Anterior wings long, narrow; discoidal cell somewhat similar to that in *Triplectides*; cross-

vein closing discoidal cell slightly concave; thyridial cell in males only slightly longer than discoidal cell, but broader than in *Triplectides*. In posterior wings fork 1 absent. Male genitalia with segment 10 short and broad, superior appendages short, dorso-ventrally flattened; in female dorsal lobes short.

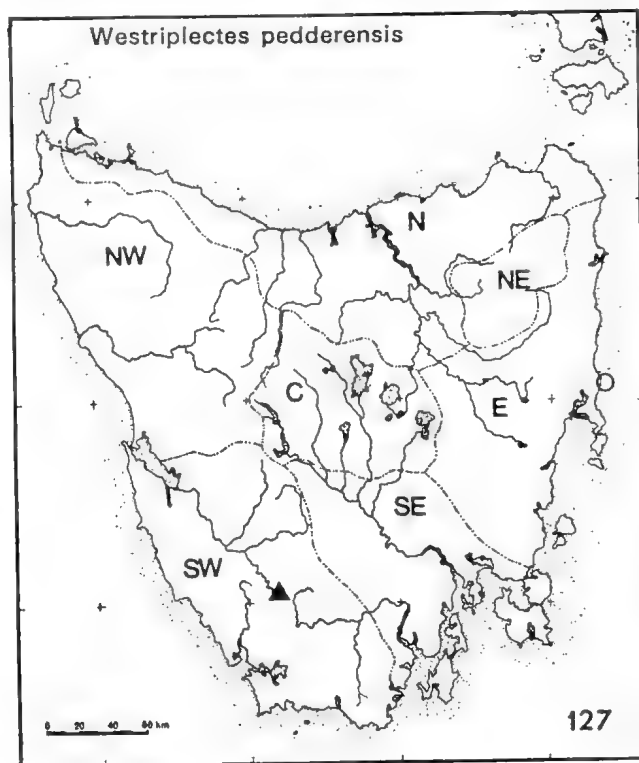
Spurs 2:2:4.

## 127 *Westriplectes pedderensis* sp. n.

Figures 683-689

Apex of the anterior wings rounded in males, more acute in females; posterior wings broader, with wider anal fan in males.

♂ genitalia with dorsal margin of tergite 9 produced into a moderately long, narrow, membranous projection, which has minute median excision at apex. Segment 10 short, broad, apex widely and deeply excised. Superior appendages short, oval. Phallus short, partly membranous, with sclerotized, lateral, ventrally directed lobes near the middle. Inferior appendages four-branched; main branch long, short bristles on the inner surface; median branch short, flat, curved inward, apical margin covered with a row of minute chitinous teeth;



mesal branch short, truncate; lower branch broad at base.

♀ abdomen terminates with acutely pointed, triangular, dorsal projection on segment 9; lower angles acute; dorsal plates short, truncate apically; lateral plates oval.

*Length of anterior wing:* ♂ 14-15 mm; ♀ 10-11.5 mm.

*Type material:* Holotype ♂ (T5376), allotype ♀ (T5377), 3 ♂ 6 ♀ paratypes (T5378-T5386) Lake Pedder, Tas., 1 Feb. 1965, A. Neboiss (NMV).

*Distribution:* Tasmania—SW province.

### Genus *Triplectides* Kolenati

*Triplectides* Kolenati, 1859:247; Mosely, 1936b:92; Mosely and Kimmins, 1953:199 (list of references and synonymy); Fisher, 1965:59.

*Pseudonema* McLachlan, 1862:305.

*Notanotolica* McLachlan, 1866:256; Ulmer, 1906:31; Ulmer, 1907:130; Mosely, 1936b:93.

*Type species:* *Mystacides gracilis* Burmeister, 1839.

The anterior wings slender, discoidal cell with lower distal angle more or less produced downwards; cross-vein closing discoidal cell concave, often less distinctly so in females; forks 1 and 5 present in males, forks 1, 3 and 5 present in females; thyridial cell long and narrow. Posterior wings with more or less widened anal area; fork 1 present with short footstalk; fork of M does not reach cross-vein r-m.

Spurs 2:2:2; 2:2:4.

The genus is widely distributed throughout the SE Asian and Australian regions, and it is also known from South America. A more detailed study of tropical forms might call for further taxonomic changes.

### KEY FOR SEPARATING TASMANIAN SPECIES

(Males only)

1. Spurs 2:2:2 . . . . . 2
- Spurs 2:2:4 . . . . . 4
2. Mesoscutum with two widely separated rows of setiferous punctures . . . . . *ciuskus*
- Mesoscutum with setiferous punctures arranged in two bands . . . . . 3
3. Eyes normal in males . . . . . *magnus*
- Eyes exceptionally large in males . . . . . *similis*

4. In anterior wing of males, part of lower margin of discoidal cell and a short section of M both thickened forming a short fold . . . . . *truncatus*
- In anterior wing of males, lower margin of discoidal cell not so thickened . . . . . 5
5. Inner marginal plates at the base of inferior appendages broadly triangular . . . . . *elongatus*
- Inner marginal plates at the base of inferior appendages bilobed apically . . . . . 6
6. Inferior appendages with basal branch short, broad at base, tapered apically . . . . . *bilobus*
- Inferior appendages with basal branch long, cylindrical . . . . . *proximus*

### 128 *Triplectides ciuskus* Mosely

Figures 690-693

*Triplectides ciuska* Mosely in Mosely and Kimmins, 1953:209.

*Triplectides ciuskus*, Fisher, 1972:62.

Anterior wings brown to blackish-brown; mesoscutum elongate with two narrow rows of setiferous punctures.

Spurs 2:2:2.

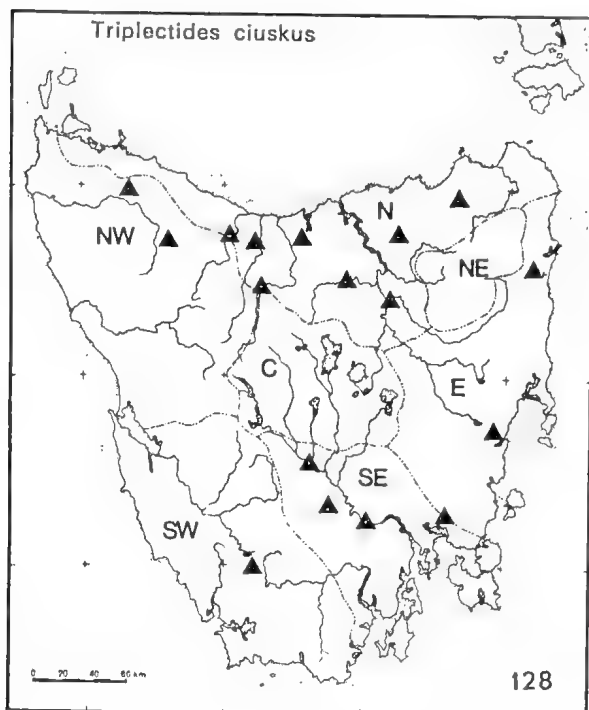
♂ genitalia in dorsal view with distal margin of tergite 9 slightly produced, a small, membranous median projection immediately below. Superior appendages of medium size, tapering apically. Segment 10 apically truncate with slight depression in the middle, sides produced downwards into small lateral lobes. Phallus slightly dilated apically, with median excision. Inferior appendages three-branched, stout at base; upper branch the longest, rounded apically; second branch shorter, strongly chitinized, curved inwards, apex acute; third branch arises from the base, reaches only half the length of upper branches, rounded apically. Inner marginal plates hooked apically.

♀ abdomen terminates with two pairs of plates.

*Length of anterior wing:* ♂ ♀ 14-15 mm.

*Type material:* Type ♂ Mt Kosciusko, 3000 ft., N.S.W., 20 Jan. 1914 (BMNH); ♂ ♀ paratypes Dunwich, Qld., Sept. 1926, Mackerras (ANIC). Type not seen.

*Material examined:* Tasmania—12 ♂ 4 ♀ Scamander River, Upper Scamander, 9 Nov. 1972; 1 ♀ Buxton



River, Mayfield, 13 Nov. 1972; 1 ♀ South Esk River, Evandale, 1 Mar. 1967; 3 ♂ Huon River nr. Scotts Peak, 8 Feb. 1965; 1 ♂ Tyenna River, National Park, 6 Dec. 1972, P. Zwick; 3 ♂ Grt. Forester River 5 km NW Forester, 11 Nov. 1972; 8 ♂ 3 ♀ Rubicon River 8 km SE of Sassafras, 2 Dec. 1974; 1 ♂ Meander River 3 km N of Westbury, 16 Dec. 1974; 1 ♀ Lilydale, creek 2 km N, 16 Dec. 1974; 1 ♀ Wilmot River 10 km S of Forth, 13 Dec. 1974; 1 ♀ Sorell River 3 km N of Sorell, 8 Dec. 1974; 3 ♂ Dee River 8 km NW of Ouse, 9 Dec. 1974; 1 ♀ Derwent River 3 km W of New Norfolk, 7 Dec. 1974; 1 ♂ Dip River Falls, 1 Dec. 1974; 1 ♂ 1 ♀ Hellyer Gorge, 12 Dec. 1974; 1 ♂ 1 ♀ Leven River nr. Heka, 17 Nov. 1972; 2 ♀ Mersey River, Liena, 16 Dec. 1972. All specimens collected by A. Neboiss unless stated otherwise (NMV).

Victoria—5 ♂ 2 ♀ Thomson River nr. Cowwarr weir, 26 Oct. 1973, A. Neboiss (NMV).

**Distribution:** Tasmania—N, NW, SW, SE and E provinces; Victoria; New South Wales; Queensland.

## 129 *Triplectides magnus* (Walker)

Figures 694-696

*Leptocerus magnus* Walker, 1852:73; McLachlan, 1862:307.

*Notanatolica magna*, McLachlan, 1866:257; Ulmer, 1907:130.

*Triplectides magna*, Mosely, 1936b:100; Betten and Mosely, 1940:229; Mosely and Kimmins, 1953:200.

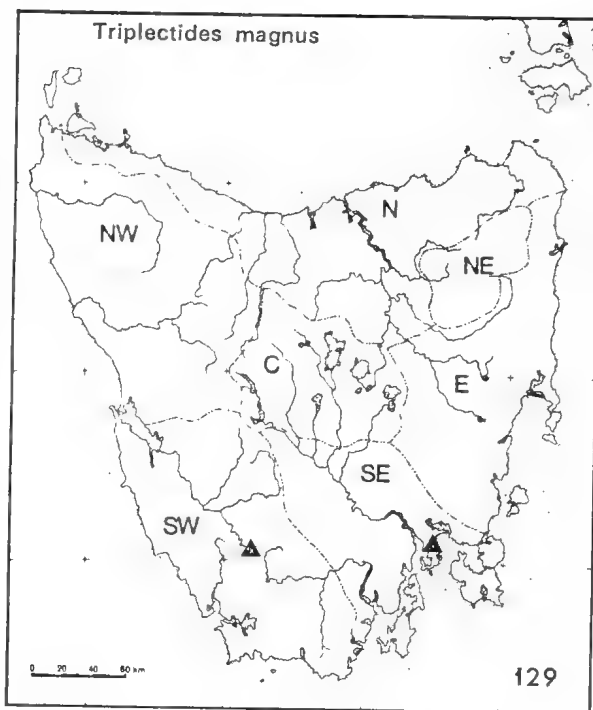
*Triplectides magnus*, Fisher, 1965:65 (complete list of references); 1972:63.

This species, originally described from Tasmania, has since been recorded from numerous localities as far away as India, China and Japan. It is distinguished from the other three Tasmanian *Triplectides* species with spurs 2:2:2, by the normal sized eyes, gradually widening rows of setiferous punctures on the mesoscutum and a pair of double punctures on the scutellum.

♂ genitalia of similar plan to that in *ciuskus* but stouter. The second branch of inferior appendages distinctly bidentate.

♀ abdomen with distal margin of end tergite truncate; the lower pair of terminal plates striate on inner surface.

Length of anterior wing: ♂ 15-18 mm; ♀ 17-18 mm.



**Type material:** Type ♂ 'Van Dieman's Land. From Dr Hooker's Collection' (BMNH). Type not seen.

**Material examined:** Tasmania—3 ♂ 3 ♀ Lake Pedder, 31 Jan. 1965, A. Neboiss (NMV); 1 ♂ Hobart, nr. airport, 31 Oct. 1975, J. R. Penprase (TM).

**Distribution:** Tasmania—SW and SE provinces; Australian mainland; SE Asia.

130 *Triplectides similis* Mosely

Figures 697-698

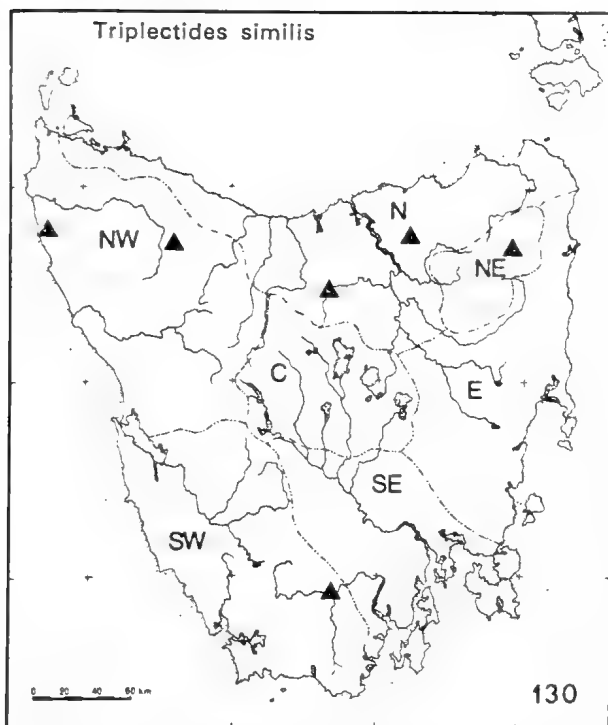
*Triplectides similis* Mosely in Mosely and Kimmins, 1953:210.

Anterior wing venation similar to that in *ciuskus*, but lower distal angle not as much produced downward. In posterior wings fork 1 with very short footstalk; fork 5 extended basally well beyond cross-vein r-m, discoidal cell long; the eyes are very large; mesosternum laterally in males slightly constricted near the base of the wings; setiferous punctures arranged in two rather broad lines; scutellum with setiferous punctures forming a pair of small warts.

♂ genitalia with upper branches of inferior appendages more slender than in *magnus*, the second branch only half the length of the upper and terminates with mesally directed claw.

♀ abdomen with end tergite truncate distally, the lower pairs of terminal plates striate on inner surface.

Length of anterior wing: ♂ 17-18 mm; ♀ 18 mm.



Type material: Type ♂ Deloraine, Tas., 27 Dec. 1884, McLachlan collection (BMNH). Type not seen.

Material examined: Tasmania—1 ♂ Sundown Creek 25 km S of Marrawah, 30 Nov. 1974; 1 ♂ Huon-Picton River junction, 18 Feb. 1967; 3 ♀ St. Columba Falls, Pyengana, 21 Feb. 1971; 1 ♀ Lilydale, creek 2 km N, 16 Dec. 1974. All specimens collected by A. Neboiss (NMV). 2 ♂ 1 ♀ Huon-Picton junction, 17 Feb. 1967, E. F. Riek (ANIC); 12 ♀ Hellyer Gorge, 4 Feb. 1967, E. F. Riek (ANIC).

Distribution: Tasmania—NE, N, NW and SW provinces.

131 *Triplectides truncatus* sp. n.

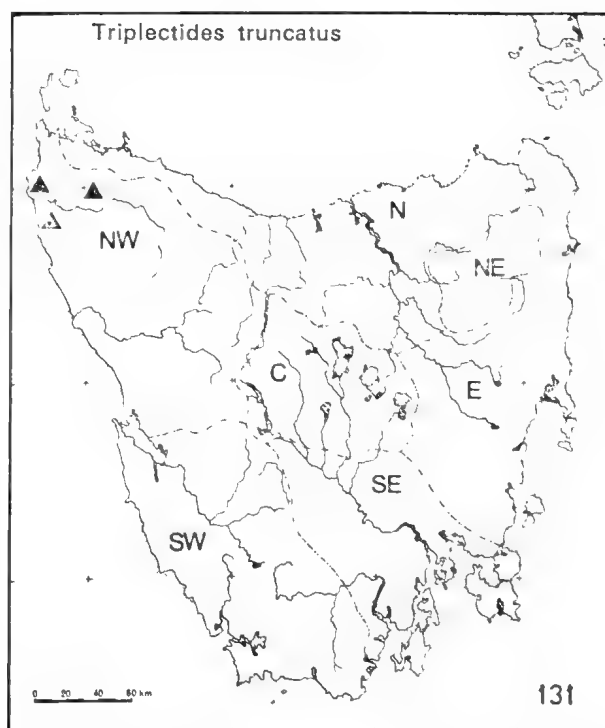
Figures 699-702

Anterior wings with discoidal cell short and broad, in males part of the vein forming the lower margin of the cell and a short section of M at anastomosis thickened and developed into a short fold.

♂ genitalia of the same pattern as in *elongatus*, but distinguished by inner marginal plates of inferior appendages, truncate at apex and outer apical angles slightly produced.

♀ abdomen terminating bluntly, the ventral side of dorsal lobes with small projections near the base; the lower pair of plates vertically striate on the inner surface.

Length of anterior wing: ♂ 10-12 mm; ♀ 12 mm.





**Type material:** Holotype ♂ (T5387), allotype ♀ (T5388), 16 ♂ 1 ♀ paratypes (T5389-T5405) Bluff Hill creek 12 km S of Marrawah, Tas., 30 Nov. 1974, A. Neboiss (NMV).

**Other material examined:** Tasmania—1 ♂ Sundown Creek 25 km S of Marrawah, 30 Nov. 1974; 2 ♂ Duck River 6 km SW Roger River, 29 Nov. 1974. All specimens collected by A. Neboiss (NMV).

**Distribution:** Tasmania—NW province.

### 132 *Triplectides bilobus* sp. n.

Figures 703-706

The species in colour and general appearance is very close to the others in the group of species with spurs 2:2:4, but differs in details of the male and female genitalia.

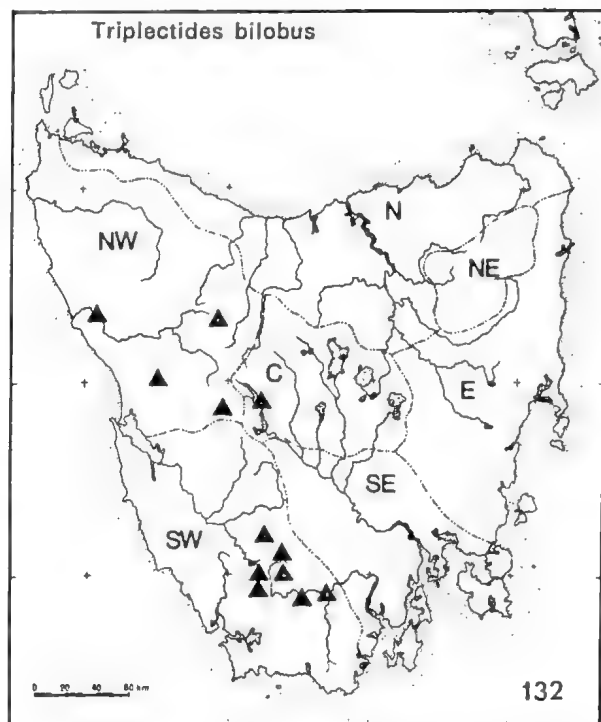
♂ genitalia with distal margin of tergite 9 rounded, closely below the margin in the middle a pair of small, semi-membraneous triangular protuberances. Superior appendages slender, rod-like, apices rounded. Segment 10 short, triangular, wide at base, a small incision at apex. Inferior appendages three-branched, basal part enlarged, upper branch slender, small spines on inner apical surface; second branch half the length of upper branch, lower margin near the apex minutely dentate; basal branch short, broader at base, tapering and curved outward distally, inner marginal plate bilobed, mesal lobe smaller and somewhat pointed, outer lobe larger and rounded apically.

♀ abdomen terminates with truncate dorsal plate which has a pair of small, triangular projections at the centre of distal margin.

**Length of anterior wing:** ♂ 16-18 mm; ♀ 15-17 mm.

**Type material:** Holotype ♂ (T5406), allotype ♀ (T5407), 3 ♂ 6 ♀ paratypes (T5408-T5416) Franklin River 20 km SW of Derwent Bridge, Tas., 11 Feb. 1971, A. Neboiss (NMV).

**Other material examined:** Tasmania—5 ♂ 1 ♀ Henty River 12 km NW Queenstown, 10 Feb. 1971; 1 ♀ Derwent River 2 km NW Derwent Bridge, 12 Feb. 1971; 5 ♂ 15 ♀ Huon River Crossing, 16 Feb. 1971; 10 ♂ 2 ♀ Condominion Creek, 15 Feb. 1971; 5 ♂ 4 ♀ Wedge River, 17 Feb. 1971; 5 ♂ 1 ♀ West Arthur Plains, 4-7 Feb. 1965; 3 ♀ Huon River nr. Scotts Peak, 8 Feb. 1965; 25 ♂ 15 ♀ Huon-Picton River junction, 18 Feb. 1967; 2 ♂ Huon River nr. Blakes Opening, 9 Feb. 1966; 1 ♂ 1 ♀ Corinna, 13 Mar. 1972, G. Minko; 2 ♂ 4 ♀ Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971. All specimens col-



lected by A. Neboiss unless stated otherwise (NMV).

**Distribution:** Tasmania—C, NW and SW provinces.

### 133 *Triplectides proximus* sp. n.

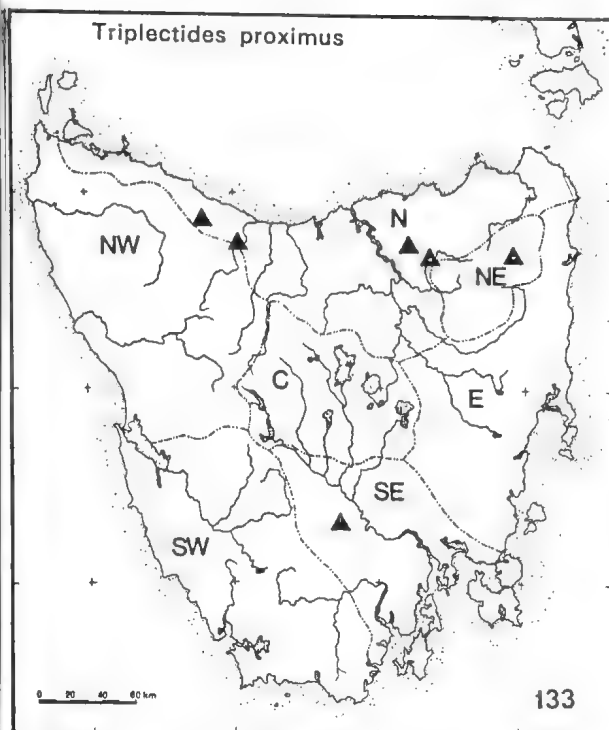
Figures 707-708

Very similar to *bilobus*, but general colouring blackish-brown; otherwise only genitalic structures separate these two closely related species. Main area of distribution of *proximus* lies North and East of that of *bilobus*.

♂ genitalia with distal margin of tergite 9 rounded, a small, rounded semi-membraneous protuberance in the middle just below the margin. Inferior appendages with basal branch long, cylindrical, apices rounded; the inner marginal plate bilobed, mesal lobe short, broad, rounded, outer lobe about as wide or narrower.

♀ abdomen similar to that in *bilobus*, but dorsal plate with distal margin slightly concave; the pair of rounded projections in the middle of distal margin varies from quite distinct to none existent.

**Length of anterior wing:** ♂ 13-16 mm; ♀ 14-16 mm.



*Type material:* Holotype ♂ (T5417) Leven River nr. Heka, Tas., 17 Nov. 1972; allotype ♀ (T5418) St. Patricks River, Targa, Tas., 22 Feb. 1971; 10 ♂ paratypes (T5419-T5428) Leven River nr. Heka, Tas., 17 Nov. 1972; 5 ♂ 5 ♀ paratypes (T5429-T5438) St. Patricks River, Targa, Tas., 22 Feb. 1971. All specimens collected by A. Neboiss (NMV).

*Other material examined:* Tasmania—1 ♂ Guide River Falls nr. Ridgley, 18 Nov. 1972; 2 ♂ National Park, 19 Feb. 1971; 1 ♂ 7 ♀ National Park, Tyenna River, 6 Dec. 1972, P. Zwick; 20 ♂ 2 ♀ Lilydale, creek 2 km N, 16 Dec. 1974; 14 ♂ 17 ♀ St. Columba Falls, Pyengana, 21 Feb. 1971. All specimens collected by A. Neboiss unless stated otherwise (NMV).

*Distribution:* Tasmania—N, NE and SE provinces.

### 134 *Triplectides elongatus* Banks

Figures 709-711

*Triplectides elongatus* Banks, 1939:486; Fisher, 1965: 62; 1972:62.

*Triplectides dubius* Mosely in Mosely and Kimmins, 1953:219; Fisher, 1972:62. **syn. nov.**

Dark, blackish-brown species. Anterior wings with discoidal cell short and broad; in males the vein forming lower margin of the cell is not thickened and there is no fold on M at the anastomosis.

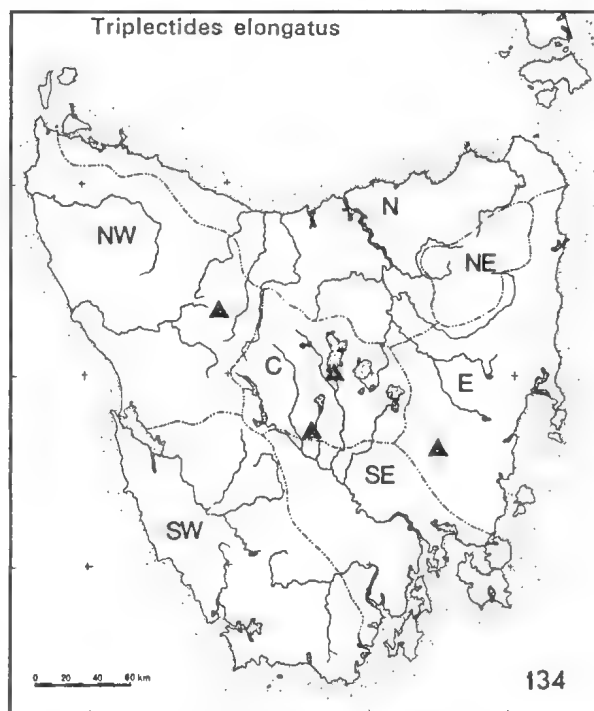
The Tasmanian specimens from several localities, including one male from Cradle Mountain, were identified as *Triplectides dubius* as described by Mosely and Kimmins 1953. These were compared with the type of *Triplectides elongatus* Banks and found that they did not show sufficient differences to regard them as separate taxonomic units and therefore both these forms are now considered conspecific.

In the absence of female specimens from Tasmania, the figure and description of this sex is given from the type female collected at Barrington Tops, N.S.W.

♂ genitalia more slender than in *truncatus*, the inner marginal plate at the base of inferior appendages triangular.

♀ abdomen terminates with a pair of stout, dorsal, finger-like projections; below them a pair of curved lobes, concave at lower margin near apex.

*Length of anterior wings:* ♂ 12-14 mm; ♀ 14 mm.



*Type material:* Type ♂ Blackheath, Blue Mtns. 3000 ft., N.S.W., 21 Jan. 1932, Harvard Expedition, Darlington; MCZ Type 22079 (ANIC); type ♀ Barrington Tops, 5000 ft.,

N.S.W., 9 Feb. 1932, Harvard Expedition, Darlington (ANIC). Both types examined.

*Triplectides dubius* Mosely, Type ♂ Cradle Mtn., Tas., 18 Jan. 1917, R. J. Tillyard (BMNH). Type not seen.

**Material examined:** Tasmania—1 ♂ Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971, A. Neboiss (NMV); 7 ♂ Miena 3400 ft., 24 Jan. 1961, L. Couchman (NMV); 1 ♂ Andover, York Rivulet, 4 Dec. 1974, A. Neboiss (NMV); 2 ♂ Bradys Lake, 9 Dec. 1974, A. Neboiss (NMV).

New South Wales—2 ♂ Styx River 12 km S of Ebor, 17 Oct. 1973, A. Neboiss (NMV).

**Distribution:** Tasmania—NW, C and E provinces; New South Wales.

### Genus *Notoperata* gen. n.

**Type species:** *Hudsonema sparsa* Kimmins, 1953.

The genus *Hudsonema* was originally described by Mosely (1936) to include two New Zealand species. The two Australian species—*maculata* and *sparsa*—added to the genus in 1953 differ considerably not only in the pattern of the genitalia, but also in the proportional length of thyridial cell in the anterior wings. Based on these differences, both Australian species are now transferred to a new genus described herewith, and the generic name *Hudsonema* is removed from the Australian list.

Anterior wings long and narrow; lower margin of discoidal cell in a straight line with the continuing vein; thyridial cell about as long as discoidal cell in males, but longer in females. Posterior wings with fork 1 present, footstalk longer than the width of discoidal cell. Male genitalia typical of those found in *Triplectides*, except that the basal branch of the three-branched inferior appendages very small.

Spurs 2:2:4, slender.

Two species known from mainland Australia and both are also found in Tasmania.

### KEY FOR SEPARATING SPECIES

1. Superior appendages short, rounded apically; anterior wings less than 10 mm long . . . . . *sparsa*
- Superior appendages elongate oval; anterior wings more than 12 mm long . . . . . *maculata*

## 135 *Notoperata sparsa* (Kimmins) comb. n.

Figures 712-716

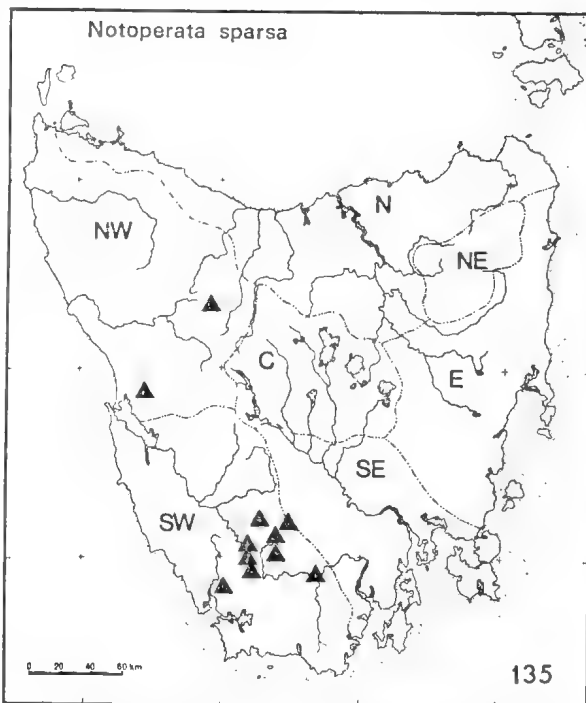
*Hudsonema sparsa* Kimmins in Mosely and Kimmins, 1953:246.

Anterior wings dark, blackish-brown, nygma round. In posterior wings the distance between cross-vein r-m and the fork of M, greater than the length of the cross-vein.

♂ genitalia with superior appendages short, rounded. Segment 10 in lateral view tapering and upcurved apically. Phallus short, curved downward, apex truncate. Inferior appendages three-branched; upper branch finger-like, slender, rounded apically; second branch curved inwards; basal branch very short, directed ventrolaterally, broad at base; inner marginal plate hooked apically.

♀ abdomen: tergite 9 distally with small, semi-membraneous, more or less distinctly bi-pointed, median lobe; dorsal plates oval, in lateral view lower margin slightly extended ventrally; lateral plates short, rounded apically.

**Length of anterior wing:** ♂ 8-10 mm; ♀ 8-9 mm.



**Type material:** Type ♂ Cradle Mtn., Tas., 18 Jan. 1917, R. J. Tillyard (BMNH). Type not seen.

**Material examined:** Tasmania—44 ♂ 14 ♀ West Arthur Plains, 6 Feb. 1965; 9 ♂ 11 ♀ Lake Pedder, 31 Jan. 1965; 1 ♀ Huon River Crossing, 8 Feb. 1965; 1 ♂ same loc., 16 Feb. 1971; 4 ♂ 1 ♀ Huon Plains nr. Scotts Peak, 2 Feb. 1965; 3 ♂ 10 ♀ Wedge River, 17 Feb. 1971; 12 ♂ 4 ♀ Spring River, 5 Feb. 1966; 1 ♂ 1 ♀ Condominion Creek nr. Mt Eliza, 10 Feb. 1965; 1 ♂ 2 ♀ same loc., 15 Feb. 1971; 1 ♂ Huon-Picton River junction, 18 Feb. 1967; 1 ♂ 1 ♀ NE of Mt Bowes, Port Davey Track (nr. Damper Inn), 11 Feb. 1965. All specimens collected by A. Neboiss (NMV). 5 ♂ 10 mls E Strahan, 6 Feb. 1967, E. F. Riek (ANIC).

**Distribution:** Tasmania—NW and SW provinces.

### 136 *Notoperata maculata* (Mosely) comb. n.

Figures 717-720

*Hudsonema maculata* Mosely in Mosely and Kimmins, 1953:245.

*Triplexina lobata* Jacquemart, 1965:24; Neboiss, 1974c:15; **syn. nov.**

Anterior wings dark brown, nygma distinctly elongate. In posterior wings the distance between cross-vein r-m and form of M very short, shorter than the length of the cross-vein.

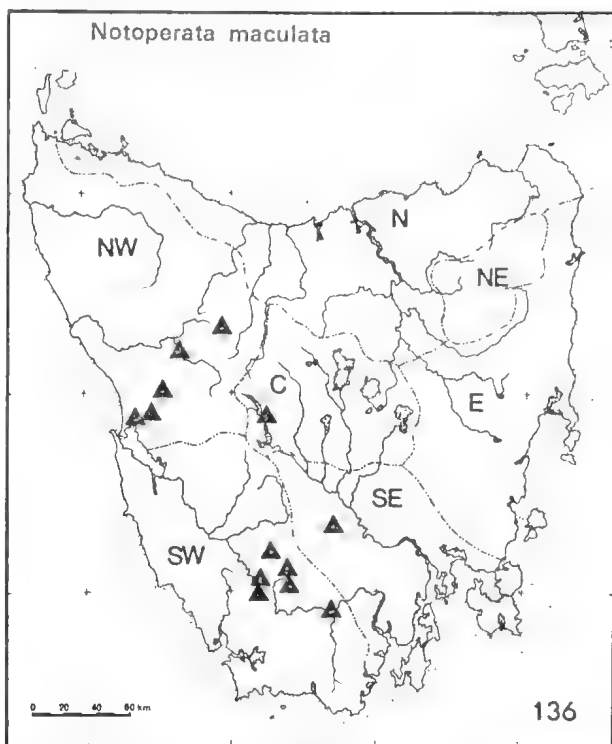
♂ genitalia similar to *sparsa*, but somewhat more elongate; superior appendages elongate oval. The basal branches of inferior appendages short, finger-like; inner marginal plates hooked and somewhat truncate apically.

♀ genitalia with tergite 9 distally produced into a more or less distinct, bipointed median lobe; dorsal plates oval, in lateral view the lower inner angle distinctly produced, ventral plate mesally with several transversal ridges.

**Length of anterior wing:** ♂ 12-15 mm; ♀ 11-14 mm.

**Type material:** Type ♂ Leura, Blue Mtns., New South Wales, 3000 ft., 6 Oct. 1914 (BMNH). Type not seen.

Holotype ♂ of *Triplexina lobata* Jacquemart, 'Otrokan' 6 Feb. 1923, A. Tonnoir (IRScNB). The locality name is a misspelling for 'Strahan' (Neboiss, 1974c). Type specimen is dissected and mounted on three microscope slides, and the comparison shows the characteristics of *maculata*, particularly the elongate nygma and finger-like basal branches of inferior appendages. On the slide containing wings only, the anterior wing belongs to the type, the posterior wing is that of *Oecetis arcada*.



**Material examined:** Tasmania—1 ♀ National Park, 20 Feb. 1967; 1 ♂ Derwent River 2 km NW Derwent Bridge, 12 Feb. 1971; 9 ♂ 4 ♀ Waldheim, Cradle Mtn. Nat. Park, Feb. 1971; 10 ♂ Huon-Picton River junction, 18 Feb. 1967; 1 ♀ Huon Crossing, Port Davey Track, 8 Feb. 1965; 1 ♂ 1 ♀ Huon Plains nr. Scotts Peak, 2 Feb. 1965; 1 ♂ 2 ♀ same loc., 8 Feb. 1965; 1 ♂ Condominion Creek nr. Mt Eliza, 10 Feb. 1965; 12 ♂ 3 ♀ same loc., 15 Feb. 1971; 2 ♀ Henty River 12 km NW Queenstown, 10 Feb. 1971; 4 ♂ 8 ♀ Wedge River, 17 Feb. 1971; 12 ♂ 4 ♀ Lake Pedder, 31 Jan. 1965. All specimens collected by A. Neboiss (NMV).

2 ♂ 6 mls E Queenstown, 8 Feb. 1967, E. F. Riek (ANIC); 2 ♂ Huon-Picton junction, 17 Feb. 1967, E. F. Riek (ANIC); 2 ♂ Derwent Bridge, 12 Feb. 1967, E. F. Riek (ANIC); 3 ♂ 1 ♀ 10 mls E. Strahan, 6 Feb. 1967, E. F. Riek (ANIC); 5 ♂ 1 ♀ Murchison River, 5 Feb. 1967, E. F. Riek (ANIC).

**Distribution:** Tasmania—NW, SW, C and SE provinces; New South Wales.

### Genus *Symphitoneuria* Ulmer

*Symphitoneuria* Ulmer, 1906:31; 1907:131; Mosely, 1936b:117; Mosely and Kimmins, 1953:260.  
*Loticana* Mosely, 1936b:121.

**Type species:** *Leptocerus exiguus* McLachlan, 1862.

The anterior wing venation differs in sexes; in males part of M is fused with lower margin of discoidal cell; in females venation normal, discoidal cell extends distad of cross-vein r-m, thyridial cell about as long as discoidal cell.

Posterior wings similar in both sexes, wider than the anterior wings; fork 1 absent; fork of M reaches basad beyond the cross-vein below the discoidal cell.

Male genitalia pattern close to that found in the genus *Triplectides*.

Spurs 2:2:2.

Only one species recorded from Tasmania.

### 137 *Symphitoneuria opposita* (Walker)

Figures 721-723

*Leptocerus oppositus* Walker, 1852:73.

*Notanotolica opposita*, McLachlan, 1866:73; Ulmer, 1906:31; 1907:131.

*Loticana opposita*, Betten and Mosely, 1940:131; Ulmer, 1951:404.

*Symphitoneuria opposita*, Mosely and Kimmins, 1953: 264 (also further references).

This dark-greyish species, although being one of the first described from Tasmania, was not found to be at all common during this survey. Early records from Victoria are substantiated by new material from several localities, but no new material is available from Western Australia.

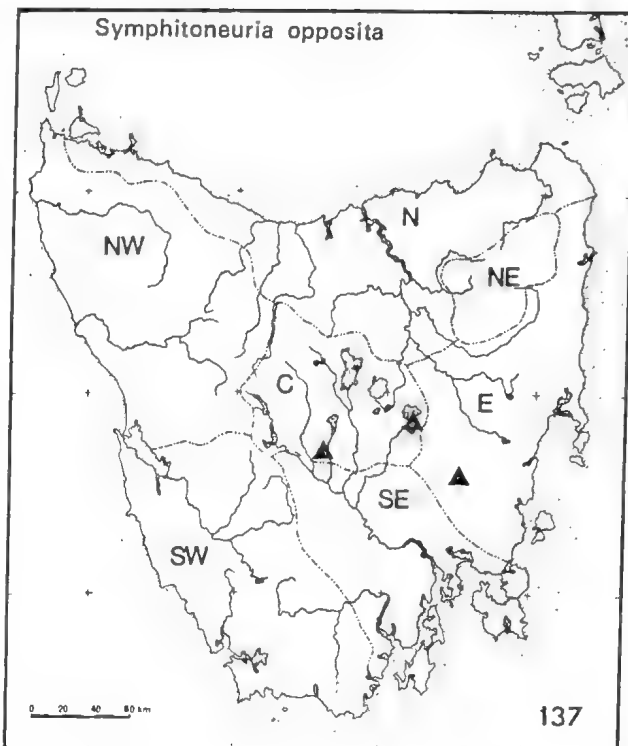
♂ genitalia with tergite 9 broadly triangular. Superior appendages moderately long, gradually dilated apically. Segment 10 long and broad, apex deeply and narrowly excised; lateral margins with small, triangular projections about midway, where there is also a transversal chitinous ridge across the segment. Phallus short, with a short, truncate plate beneath. Inferior appendages three-branched; the upper branch slightly shorter than the second, which terminates with claw-shaped apex; a small, angular, inward and downward directed mesal plate, bearing several strong spines, arises from the inner margin of the upper branch. From the base of inferior appendages arise inwardly directed, subangular plates and ventrally a moderately long third branch.

♀ abdomen terminates bluntly with a pair of dorsal and a pair of lateral plates.

Length of anterior wing: ♂ 11-12 mm; ♀ 11 mm.

Type material: Type ♀ 'Tasmania', no other data (BMNH). Type not seen.

Material examined: Tasmania—1 ♂ Andover, York Rivulet, 4 Dec. 1974, A. Neboiss (NMV); 1 ♂ Bradys Lake, 9 Dec. 1974, A. Neboiss (NMV); 7 ♂ 1



♀ Canal at Interlaken, 2 Feb. 1966, G. F. Edmunds (ANIC).

Victoria—1 ♂ Tyres River, 26 Oct. 1973; 1 ♂ Tanjil River, Walhalla Rd bridge, 22 Oct. 1973; 1 ♂ Latrobe River, Yallourn, No 3 lake, 24 Oct. 1973; all collected by C. McCubbin during Latrobe River survey (NMV).

Distribution: Tasmania—C, E and SE provinces; Victoria; Western Australia; Celebes.

### Genus *Triplectidina* Mosely

*Triplectidina* Mosely, 1936b:107; Mosely and Kimmins, 1953:233.

Type species: *Triplectides oreolimnetes* Tillyard, 1924.

Anterior wing venation differing in sexes; in males, part of lower margin of discoidal cell and part of M at the same distance thickened; thyridial cell absent; in females venation normal; distal end of discoidal cell only a short distance distad of anastomosis, cross-vein closing the cell straight; thyridial cell present. Posterior wings with fork 1 present, although often rather indistinct and sometimes absent.  $R_2$  very short, forming almost right angle with  $R_3$ .

Spurs 2:2:4.

Only one species occurs in Tasmania.

138 *Triplectidina nigricornis* Mosely

Figures 724-726

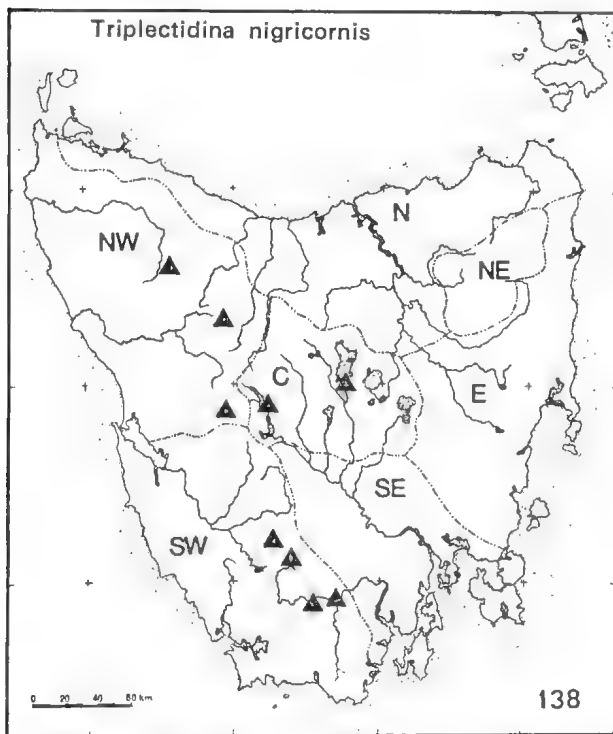
*Triplectidina nigricornis* Mosely, 1936b:109; Mosely and Kimmins, 1953:235.

Anterior wings dark brown with greyish and fuscous pubescence, venation as described in generic diagnosis.

♂ genitalia with distal margin of tergite 9 developed into a short, triangular projection. Superior appendages short, situated close together, dorso-ventrally flattened. Segment 10 long, narrowly and deeply cleft at apex, distal half of lateral margins covered with short, stiff bristles. Phallus short. Inferior appendages three-branched, the main upper and outer branch the longest, apex with few short, dark peg-like spines on inner surface; the inner branch slender, curved mesally; lower branch shorter, finger-like.

♀ abdomen with terminal segment dorsally slightly produced at its centre.

Length of anterior wing: ♂ 9.5-12 mm; ♀ 10-12.5 mm.



Type material: Type ♂ and paratypes Miena, Tas., 3300 ft., Dec. 1929, H. M. Stephen, in Mosely's collection (BMNH). Type not seen.

Material examined: Tasmania—8 ♂ 2 ♀ Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971; 1 ♂ Huon River Crossing, 16 Feb. 1971; 1 ♂ 1 ♀ Huon-Picton River junction, 18 Feb. 1967; 1 ♂ 1 ♀ Huon River nr. Blakes Opening, 9 Feb. 1966; 1 ♂ Wedge River, 17 Feb. 1971; 1 ♀ Franklin River 20 km SW of Derwent Bridge, 11 Feb. 1971; 2 ♀ Derwent River 2 km NW Derwent Bridge, 12 Feb. 1971; 1 ♂ Fossey River 8 km E of Waratah, 12 Dec. 1974. All specimens collected by A. Neboiss (NMV). 1 ♂ Huon-Picton junction, 17 Feb. 1967, E. F. Riek (ANIC).

Distribution: Tasmania—C, NW and SW provinces.

Genus *Lectrides* Mosely

*Lectrides* Mosely in Mosely and Kimmins, 1953:270.

Type species: *Lectrides varians* Mosely, 1953.

Anterior wing venation differing in sexes; in males a long fold in the centre of the wing, merging the lower margin of discoidal cell with M; venation normal in females, discoidal cell long, extending distad of cross-vein r-m; narrow hyaline line above thyridial cell widened at the cross-veins; thyridial cell shorter than discoidal cell. Posterior wings similar in both sexes, fork 1 absent; fork of the media usually does not reach the cross-vein below the discoidal cell.

The male genitalia diverge considerably from the normal *Triplectides* pattern; inferior appendages two-branched.

Spurs 2:2:4.

So far only one species has been included in this genus.

139 *Lectrides varians* Mosely

Figures 727-730

*Lectrides varians* Mosely in Mosely and Kimmins, 1953:270.

Anterior wings brown with indistinct dark area near the base and a pair of dark patches at pterostigma.

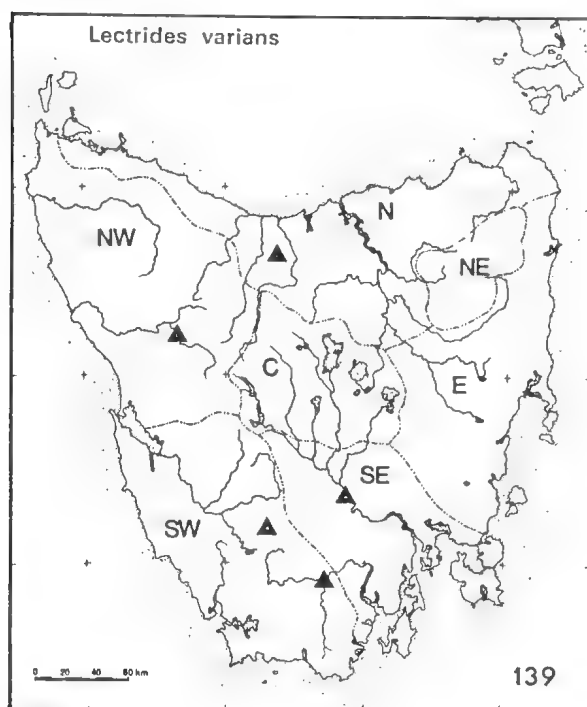
The females are similar in appearance and size to the males; posterior wings wider than the anterior pair, but without distinctly expanded anal fan; a short row of hamuli along costa extend from about the middle to distal end of discoidal cell.

♂ genitalia with distal margin of tergite 9 broad, bluntly triangular, below which is a forked process, considered by Mosely and Kimmins as the superior appendages fused at the

base. Segment 10 broad at base, tapering apically, excised in the middle. Phallus slender, terminating with a pair of rounded, lateral lobes, separated by deep mesal cleft. Inferior appendages two-branched, the upper branches slightly shorter, the lower ones longer and curved inwards apically.

♀ abdomen terminates with broadly triangular tergite; dorsal plate short, lateral plates slightly longer and apically truncate if viewed from the side.

Length of anterior wing: ♂ 10.5-12.5 mm; ♀ 10-12 mm.



**Type material:** Type ♂ Sheffield, Tas., 8 Jan. 1917, R. J. Tillyard (BMNH). Type not seen.

**Material examined:** Tasmania—3 ♂ 1 ♀ Huon-Picton River junction, 18 Feb. 1967, A. Neboiss (NMV); 1 ♀ same loc., 15 Nov. 1972, A. Neboiss (NMV); 2 ♂ Wedge River, 17 Feb. 1971, A. Neboiss (NMV); 1 ♂ Bushy Park, 23 Feb. 1967, A. Neboiss (NMV); 2 ♂ Murchison River, 5 Feb. 1967, E. F. Riek (ANIC).

Victoria—8 ♂ Myrtleford, 23 Jan. 1973, A. Neboiss (NMV); 1 ♂ Koornalla, Traralgon Creek, 10 Dec. 1973, C. McCubbin (NMV); 1 ♂ Yallourn Dam, 22 Oct. 1973, C. McCubbin (NMV); 1 ♂ Blue Lagoon, Latrobe River nr. Yallourn, 25 Oct. 1973, C. McCubbin (NMV); 1 ♂ Tanjil River, Walhalla Road bridge, 22 Oct. 1973, C. McCubbin (NMV); 1 ♂ Eustace Gap Creek, Dartmouth River Survey, 13 Feb. 1973 (NMV); 4 ♂ G.G.S. Timbertop nr. Merrig, 30 Nov. 1957, J. Landy (NMV).

**Distribution:** Tasmania—N, NW, SW and SE provinces; Victoria.

### Genus *Notalina* Mosely

*Notalina* Mosely, 1936b:114; Mosely and Kimmins, 1953:248.

*Triplexina* Mosely in Mosely and Kimmins, 1953:231 syn. nov.

**Type species:** *Notalina parkeri* Mosely, 1936.

The genus was erected by Mosely (1936) to include three species, *Notalina parkeri* from Tasmania, which was designated as the type species, and two other species from Southwest Australia, described by Ulmer in the genus *Triplectides*. The main distinguishing character was the absence of fork 1 in the posterior wings. Further species were added in 1953, all of which shared distinctive male genitalia. The discovery of a Tasmanian species, in which the male genitalia and wing venation is similar to that in other *Notalina* species (except that in posterior wings a very narrow fork 1 is usually present), required widening of the generic diagnosis. Analysis of characters found in the genus *Triplexina*, with its sole species *nigra*, clearly indicates the close relationship with *Notalina*. In longer series of specimens of *nigra*, it was observed that the fork 1 in the posterior wing sometimes is indistinct or occasionally absent. The male genitalia is typical of that found in *Notalina*. Therefore genus *Triplexina* is now placed in synonymy with *Notalina*, but the species *nigra* retains its specific status.

Anterior wings in male with discoidal and thyridial cells of approximately equal length, but the thyridial cell is longer in females; Rs slightly curved towards M between the base and discoidal cell. Posterior wings with discoidal cell rather long and slender, closed distally by more or less oblique cross-vein; fork 1 absent, or if present, very narrow.

Mesoscutum elongate, dorsally flattened, anterior margin somewhat produced anteriorly; scutellum as a small sloping plate, raised slightly above mesoscutum.

Spurs 2:2:4.

### KEY TO TASMANIAN SPECIES

(Males only)

- |   |   |
|---|---|
| 1. General colour black . . . . .       | 2 |
| — General colour yellowish to brown . . | 3 |



2. Segment 10 in lateral view obliquely truncate, apex directed upwards . . . . . *nigra*
- Segment 10 in lateral view tapered to rounded apex . . . . . *parkeri*
3. Lower margin of inferior appendages with angular or rounded sub-basal lobe, carrying a small, acute spine . . . . . 4
- Lower margin of inferior appendages with two acute spurs . . . . . *bifaria*
4. Inferior appendages in lateral view with sub-basal lobe appearing as a curved hook . . . . . *fulva*
- Inferior appendages in lateral view with only a minute spur on lower margin . . . . . *tillyardi*

#### 140 *Notalina parkeri* Mosely

Figures 731-736

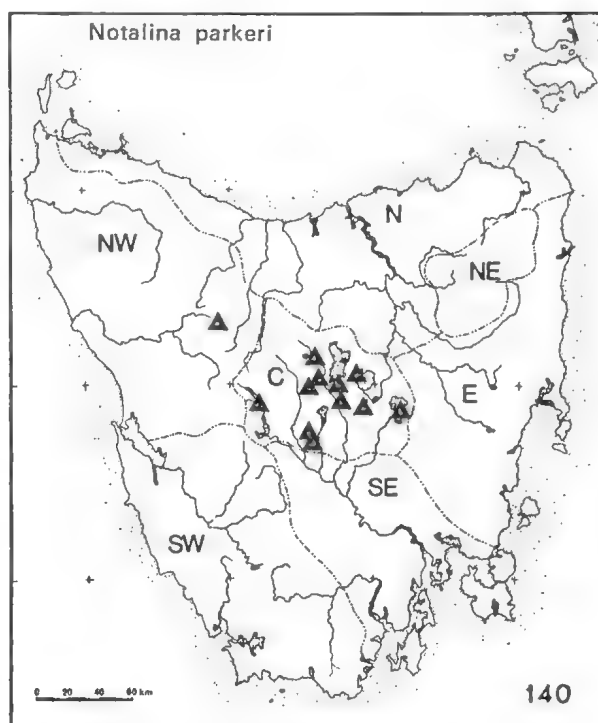
*Notalina parkeri* Mosely, 1936b:114; Mosely and Kimmins, 1953:249.

General colour black; anterior wings in males with thyridial cell about as long as discoidal cell, in females the thyridial cell is distinctly longer. In posterior wings discoidal cell long, closed with oblique cross-vein; fork 1 absent.

♂ genitalia short and broad; distal margin of tergite 9 excised in the middle, two small protuberances on either side of the excision. Superior appendages spindle shaped, slightly curved upwards. Segment 10 broad at base, with a broad, deep, U-shaped excision distally. Phallus membranous with an angular, apically acute and downturned paramere on either side. Inferior appendages with large, concave main branch; a well developed, angular, sub-basal plate on lower margin, the outer apical angle of which is produced in a short spine; at the base a short, inwardly directed branch covered with short, stiff bristles; a short mesal branch directed upwards but obscured by outer structures.

♀ abdomen terminates with a pair of triangular dorsal plates, at the base of which are a pair of small protuberances; lateral plates large subquadrate.

Length of anterior wing: ♂ 11-13 mm; ♀ 9-11 mm.



Type material: Type ♂ Great Lake, Miena, Tas., Jan. 1930, C. Parker (BMNH). Type not seen.

Material examined: Tasmania—3 ♂ 1 ♀ Miena, 3400 ft., 24 Jan. 1961, L. Couchman (NMV); 10 ♂ 8 ♀ Shanon Lagoon, 27 Feb. 1967, A. Neboiss (NMV); 12 ♂ 4 ♀ Penstock Lagoon, 27 Feb. 1967, A. Neboiss (NMV); 1 ♂ Ouse River 8 km W of Miena, 28 Feb. 1967, A. Neboiss (NMV); 8 ♂ 1 ♀ Bradys Lake, 9 Dec. 1974, A. Neboiss (NMV); 1 ♂ Interlaken, Lake Sorell, 5 Dec. 1974, A. Neboiss (NMV); 21 ♂ 7 ♀ Arthurs Lake, 5 Dec. 1974, A. Neboiss (NMV); 4 ♂ 1 ♀ Lagoon of Islands, 5 Dec. 1974, A. Neboiss (NMV); 18 ♂ Little Pine Lagoon, 23 Dec. 1960, D. Scholes (ANIC); 163 ♂ 10 ♀ same loc., 16 Feb. 1967, E. F. Riek (ANIC); 1 ♂ Bronte Lagoon, 15 Feb. 1967, E. F. Riek (ANIC); 4 ♂ Howe Lagoon nr. Lake Augusta, 29 Jan. 1966, G. F. Edmunds (ANIC); 11 ♂ 4 ♀ Penstock, Miena, 27 Feb. 1967, E. F. Riek (ANIC); 1 ♂ Ouse River 5 W Miena, 28 Feb. 1967, E. F. Riek (ANIC); 2 ♂ 13 ♀ Lake St. Clair, 13 Feb. 1967, E. F. Riek (ANIC); 2 ♂ Lake Lilla, 21 Nov. 1955, T. E. Woodward (QU).

Distribution: Tasmania—C and NW provinces.

#### 141 *Notalina fulva* Kimmins

Figures 737-740

*Notalina fulva* Kimmins in Mosely and Kimmins, 1953:257.

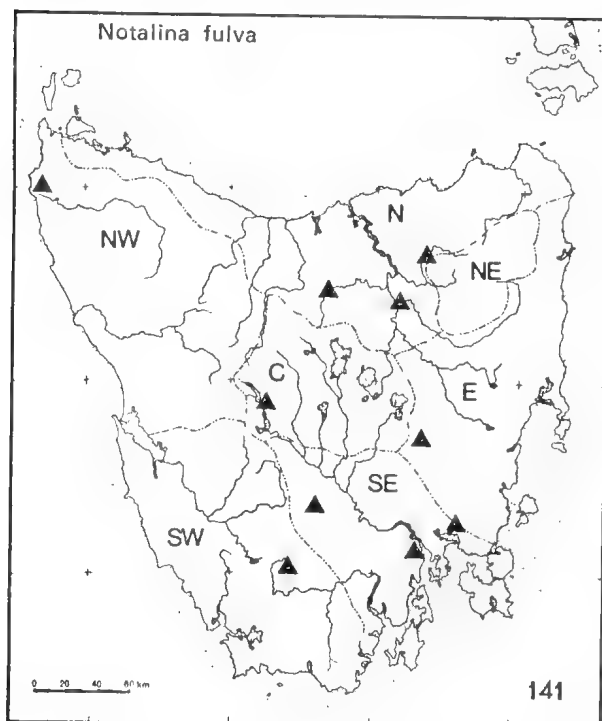
Anterior wings yellowish to brownish, the fringe fuscous at arculus; posterior wings pale, yellowish, fork 1 absent. Wing venation and

genitalia similar to *N. parkeri*. The species is widely distributed and has been recorded from New South Wales, Victoria and Tasmania.

♂ genitalia, compared with that of *parkeri*, has longer and more slender superior appendages, the inner margin of sub-basal lobe more rounded and the branch at the base in ventral view is somewhat irregular in outline.

♀ genitalia very similar but separated from *parkeri* by the yellowish colour.

Length of anterior wing: ♂ 9-16 mm; ♀ 7-11 mm.



**Type material:** Type ♂ Gisborne, Victoria, 7 Nov. 1915 (BMNH). Type not seen.

**Material examined:** Tasmania—4 ♂ Sorell River 3 km N of Sorell, 8 Dec. 1974; 4 ♂ Bluff Creek 12 km S of Marawah, 30 Nov. 1974; 3 ♂ 2 ♀ 5 km W of Oatlands, 5 Dec. 1974; 6 ♂ 4 ♀ Derwent River 2 km NW Derwent Bridge, 12 Feb. 1971; 7 ♂ 1 ♀ Condonion Creek, 15 Feb. 1971; 14 ♂ 4 ♀ South Esk River, Evandale, 1 Mar. 1967; 3 ♂ 1 ♀ Meander River, Deloraine, 28 Nov. 1974; 6 ♂ Lake Dobson, 20 Feb. 1967. All specimens collected by A. Neboiss (NMV).

**Other recorded localities in Tasmania:** Perth, St. Patricks River, Hobart, Lake St. Clair.

Large number of smaller specimens from many localities throughout the state are doubtfully referred to this species, but they are not listed here in detail.

**Distribution:** Tasmania—all provinces; Victoria; New South Wales.

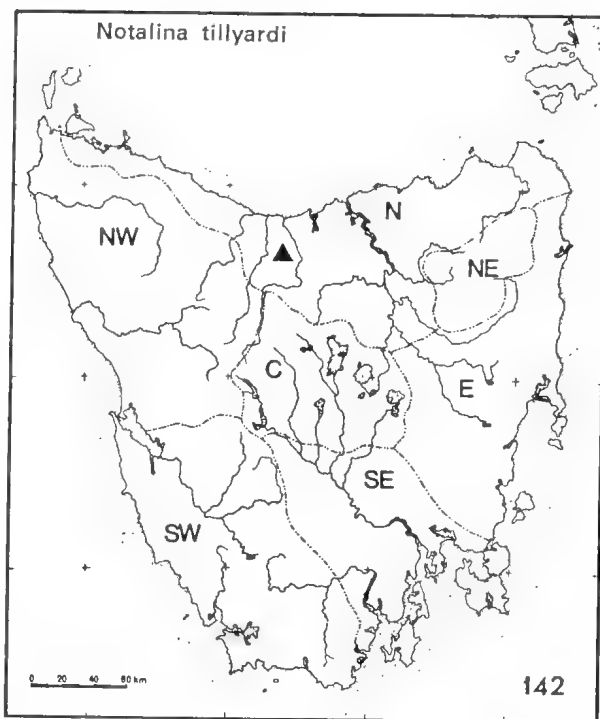
#### 142 *Notalina tillyardi* Kimmins

*Notalina tillyardi* Kimmins in Mosely and Kimmins, 1953:258.

Although a large number of specimens of the genus *Notalina* were examined from numerous Tasmanian localities, none appeared to match the figures given by Mosely and Kimmins (Fig. 179, p. 259). The description notes that it can be distinguished from *fulva* by paler colouring and that the male genitalia in lateral view shows only a small spur on the ventral margin of inferior appendages.

The female, although listed among the original material, is neither described nor figured.

Length of anterior wing: ♂ 12-13 mm; ♀ 10-11 mm.



**Type material:** Type ♂ Sheffield, Tas., 8 Jan. 1917, R. J. Tillyard (BMNH). Type not seen.

**Distribution:** Tasmania—N province (known from the type locality only).

#### 143 *Notalina bifaria* sp. n.

Figures 741-743

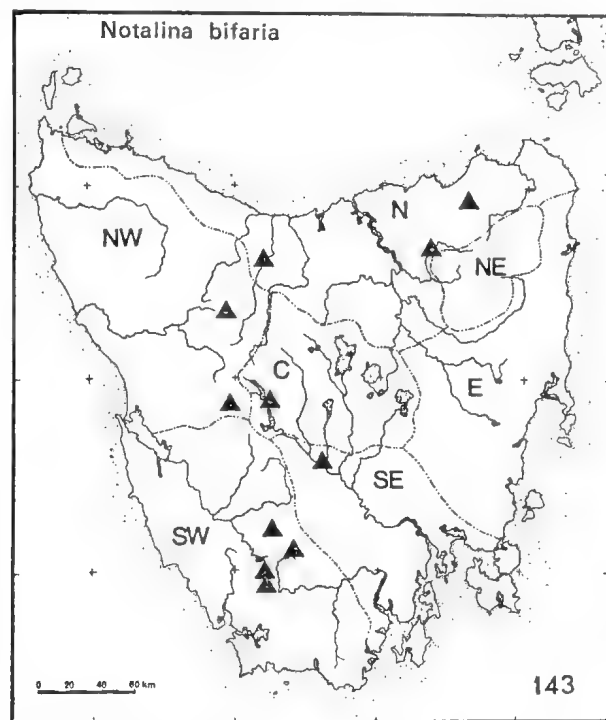
Anterior wings brown with few pale, irregu-

lar spots on wing membrane; anal margin from base to arculus and almost as far as Cu vein pale yellow; fringe distally from arculus fuscous. Posterior wings pale-yellowish, fork 1 usually present, although sometimes indistinct or entirely absent.

♂ genitalia of the same pattern as in other species of the genus, but lower margin of inferior appendages sub-basally with a pair of strong, inwardly directed spurs, welded together at their base.

♀ unknown.

Length of anterior wing: ♂ 12-13 mm.



**Type material:** Holotype ♂ (T5439), 5 ♂ paratypes (T5440-T5444) Wedge River, Tas., 17 Feb. 1971, A. Neboiss (NMV); 2 ♂ paratypes (T5445-T5446) Huon River Crossing, Tas., 16 Feb. 1971, A. Neboiss (NMV); 3 ♂ paratypes (T5447-T5449) Waldheim, Cradle Mtn. Nat. Park, Tas., 7 Feb. 1971, A. Neboiss (NMV).

**Other material examined:** Tasmania—3 ♂ Huon River nr. Scotts Peak, 8 Feb. 1965; 4 ♂ St. Patricks River nr. Targa, 22 Feb. 1971; 2 ♂ West Arthur Plains, 6 Feb. 1965; 2 ♂ Derwent River 2 km NW of Derwent Bridge, 12 Feb. 1971; 1 ♂ Dee River 8 km NW of Ouse, 9 Dec. 1974; 1 ♂ Franklin River 20 km

SW of Derwent Bridge, 11 Feb. 1971; 2 ♂ Grt. Forester River 5 km NW Forester, 11 Nov. 1972. All specimens collected by A. Neboiss (NMV).

2 ♂ Forth Falls, 28 Jan. 1967, E. F. Riek (ANIC).

**Distribution:** Tasmania—C, N, NW, SW and SE provinces.

#### 144 *Notalina nigra* (Mosely) comb. n.

Figures 744-746

*Triplexina nigra* Mosely in Mosely and Kimmins, 1953:232.

The reason for the present placing of this species are explained in the description of the genus.

Anterior wings covered with dense, black pubescence; head, thorax and abdomen also black. Anterior wings in males with thyridial cell slightly longer, in females distinctly longer than discoidal cell. Posterior wings with fork 1 usually present, although sometimes indistinct or missing.

♂ genitalia with segment 9 narrow dorsally, lateral margins broadly rounded. Superior appendages short and stout, tapered distally. Segment 10 broad at base, bifurcate distally, apices obliquely truncate. Phallus short, membranous, curved downwards, on either side with down-turned, acutely pointed parameres. Inferior appendages stout, small acute mesal processes on lower margin towards the base; inwardly directed branch at the base; upper mesal margin developed into a plate with curved, distally directed hooks.

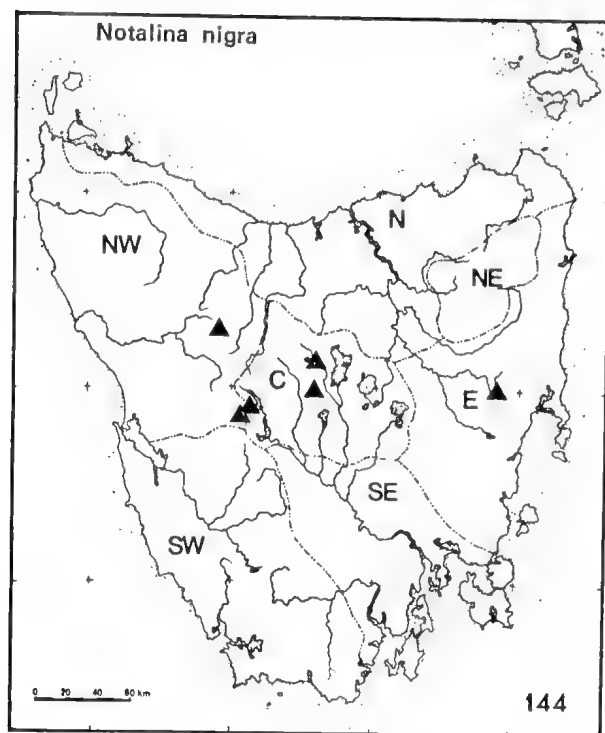
♀ abdomen ends with a pair of small dorsal processes and a pair of rounded lateral lobes.

Length of anterior wing: ♂ 7.5-9 mm; ♀ 7-8 mm.

**Type material:** Type ♂ ♀ Lake Leake, Tas., Feb. 1937, J. W. Evans (BMNH). Type not seen.

**Material examined:** Tasmania—1 ♂ Hugel River nr. Lake St. Clair, 15 Feb. 1956, E.T.S. (NMV); 1 ♂ Western Lakes, Jan. 1962, E. Cooper (NMV); 29 ♂ 2 ♀ Mountain tarn nr. Lake Dove, Cradle Mtn., 14 Dec. 1974, A. Neboiss (NMV); 1 ♀ Lake Lilla, Cradle Mtn. Nat. Park, 14 Dec. 1974, A. Neboiss (NMV); 6 ♂ 4 ♀ Little Pine Lagoon, 27 Feb. 1960, D. Scholes (ANIC); 1 ♀ Navarre River, 12 Feb. 1967, E. F. Riek (ANIC).

**Distribution:** Tasmania—E, C and NW provinces.



Subfamily LEPTOCERINAE Ulmer

The subfamily is distinguished by the open discoidal cell in the posterior wings; other characters as described for the family.

KEY FOR SEPARATING  
TASMANIAN GENERA

Subfamily LEPTOCERINAE Ulmer

1. In anterior wing thyridial cell absent . . . . . *Triaenodes*
- In anterior wing thyridial cell present . . . . . 2
2. Spurs 2:2:4 . . . . . 3
- Spurs 0:2:2, 1:2:2 or 2:2:2 . . . . . *Oecetis*
3. Posterior wing narrow; fork 3 absent . . . . . *Leptorussa*
- Posterior wing with broad anal fan, fork 3 present . . . . . *Condocer*

Genus *Condocer* gen. n.

*Type species: Condocer paludosus* gen. et sp. n.

Antennae at least twice as long as anterior wing, basal segment enlarged, about as long as the diameter of the eye, segment 2 very short, rounded, segment 3 long and slender. Maxillary palpi long, segment 2 the longest, about twice as long as segment 1. Anterior wings slender, dis-

coidal cell closed with sloping cross-vein; forks 1 and 5 present in male, forks 1, 3 and 5 present in female; thyridial cell about twice as long as discoidal cell; apical cellule 4 with foot-stalk. Posterior wing broader than the anterior wing, discoidal cell open, forks 1, 3 and 5 present in both sexes.

Spurs 2:2:4.

The combination of characters separate *Condocer* from the cosmopolitan genus *Athripsodes* and members of the Australian mainland *Leptocer*.

145 *Condocer paludosus* sp. n.

Figures 747-755

Anterior wings densely covered with fine pubescence which is darker along costal and anal margins, thus showing a pale, longitudinal central band which disappears in rubbed specimens. The first two pairs of legs covered with short, dark pubescence and appear much darker than the posterior pair.

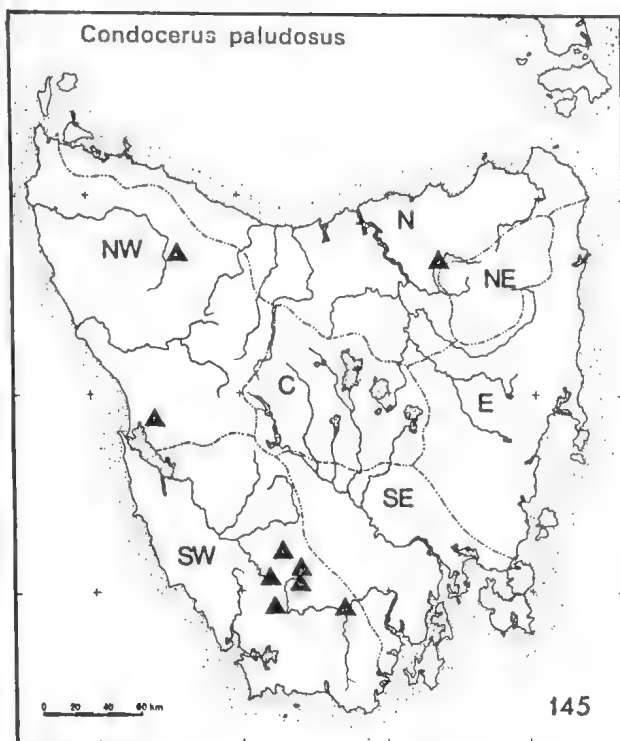
♂ genitalia—distal margin of segment 9 with a pair of small, elongate protuberances in the middle of the base of segment 10 and larger, apically tapered one on either side. Segment 10 downturned, gradually tapered towards the upcurved apex. Phallus slightly clavate; inferior appendages single segmented, robust, curved inwards, with short, broad median, inwardly-directed lobe.

♀ abdomen terminates bluntly with a down-curved, oval, dorsal plate, at the base of which is a pair of small, flat protuberances and further laterally a large, horizontally situated, rounded lobe, below that a vertically orientated, lateral lobe.

*Length of anterior wing:* ♂ 10-11 mm; ♀ 9.5-11 mm.

*Type material:* Holotype ♂ (T5450), allotype ♀ (T5451) 6 ♂ 6 ♀ paratypes (T5452-T5463) Condominion Creek, Tas., 15 Feb. 1971, A. Neboiss (NMV); 2 ♂ 3 ♀ paratypes (T5464-T5468) Lake Pedder, Tas., 1 Feb. 1965, A. Neboiss (NMV).

*Other material examined:* Tasmania—1 ♂ Hellyer River Gorge, 9 Feb. 1971; 3 ♀ Wedge River, 17 Feb. 1971; 4 ♀ Huon River Crossing, 16 Feb. 1971; 3 ♀ St. Patricks River, Targa, 22 Feb. 1971; 1 ♀ Huon-Picton River junction, 18 Feb. 1967; 1 ♀ West Arthur Plains, 6 Feb. 1965. All specimens collected by A.



Neboiss (NMV). 1 ♀ 10 mls E of Strahan 20 Feb. 1963, I. F. B. Common and M. S. Upton (ANIC).

Victoria—3 ♂ 2 ♀ Merrijig, 25 Mar. 1958, A. Neboiss (NMV); 6 ♂ 2 ♀ G.G.S. Timbertop nr. Merrijig, 15 Jan. 1958, I. Edwards (NMV); 1 ♂ 2 ♀ 7 km West of Neerim, Tarago River, 1 Mar. 1972, A. Neboiss (NMV).

**Distribution:** Tasmania—N, NW and SW provinces; Victoria.

### Genus *Leptorussa* Mosely

*Leptorussa* Mosely in Mosely and Kimmins, 1953: 272.

**Type species:** *Leptorussa russata* Mosely.

Antennae long and slender, from about one and a half times the length of anterior wing in female, to more than twice the length in male; basal segment enlarged, bulbous, segment 2 short, rounded; segment 3 long, slender. Anterior wing with forks 1 and 5 in male, 1, 3 and 5 in female; discoidal cell closed, thyridial cell almost twice the length of discoidal cell. Posterior wing narrow, forks 1 and 5 present.

Spurs 2:2:4.

The genus is close to the cosmopolitan genus *Athripsodes*, but differs from it by having a narrowed posterior wing, different structure of male genitalia and different spur formula.

Only one species recorded from Tasmania.

## 146 *Leptorussa darlingtoni* (Banks)

Figures 756-758

*Leptocerus darlingtoni* Banks, 1939:487.

*Leptorussa darlingtoni*, Mosely and Kimmins, 1953: 275.

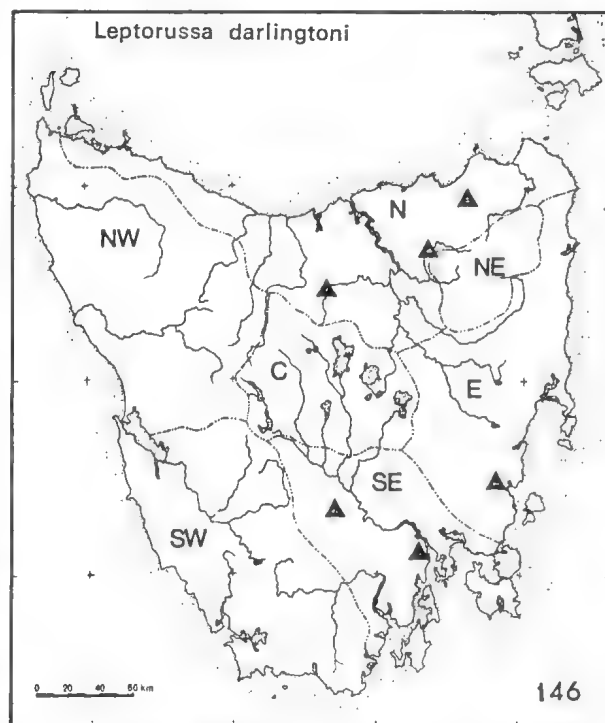
*Leptorussa russata*, Mosely in Mosely and Kimmins, 1953:274; Jacquemart, 1965b:21. **syn. nov.**

A slender, blackish-brown species. The type of *darlingtoni* agrees well with the illustrations of *russata* in Mosely and Kimmins (1953) and both are regarded as being conspecific.

♂ genitalia with upper distal margin of segment 9 produced into a pair of long, down-curved, apically clavate processes; segment 10 in form of a broad, deeply cleft plate, each branch apically tapered and terminating with outwardly directed triangular apex. Phallus appears as a narrow central spine. Inferior appendages with inner upper angle extended into a ventrolaterally curved process.

♀ abdomen terminates in a bluntly triangular apex, formed by a large, hood-shaped upper plate.

**Length of anterior wing:** ♂ 8-9 mm; ♀ 8-9 mm.



**Type material:** Holotype ♂ Aldgate, Mt Lofty Range, S.A., 29 Nov. 1931, Harvard Aust. Ex-

ped. P. J. Darlington (MCZ Type 22081), paratype ♂ same date. The type specimens are now deposited in ANIC Canberra. Type seen.

Type ♂ of *Leptorussa russata* Mosely, Lee's Spring, A.C.T., 1932, R. J. Tillyard (BMNH). Type not seen.

**Material examined:** Tasmania—6 ♂ 19 ♀ Grt. Forester River 5 km NW Forester, 11 Nov. 1972, A. Neboiss (NMV); 1 ♂ Russell Falls, National Park, 5 Dec. 1972, P. Zwick (NMV).

**Other localities recorded:** Tasmania: Deloraine, Hobart, Orford, St. Patricks River.

**Distribution:** Tasmania—N, SE and E provinces; Victoria; New South Wales.

### Genus *Triaenodes* McLachlan

*Triaena* McLachlan, 1865a:34 not *Triaena* Leconte, 1847:365.

*Triaenodes* McLachlan, 1865b:110; 1877:319; Ulmer, 1907:140; Ross, 1944:244; Mosely and Kimmins, 1953:276.

**Type species:** *Leptocerus bicolor* Curtis.

Antennae about twice as long as the anterior wing, basal segment longer than the diameter of eye, stout; segment 2 short, rounded; segment 3 and the subsequent ones long, slender. Maxillary palpi long, segments slender, thickly covered with long pubescence. Anterior wings long, narrow, apical forks 1 and 5 present, discoidal cell long, thyridial cell absent; posterior wing narrow, fork 1 only present. Spurs 1:2:2.

### 147 *Triaenodes intricata* sp. n.

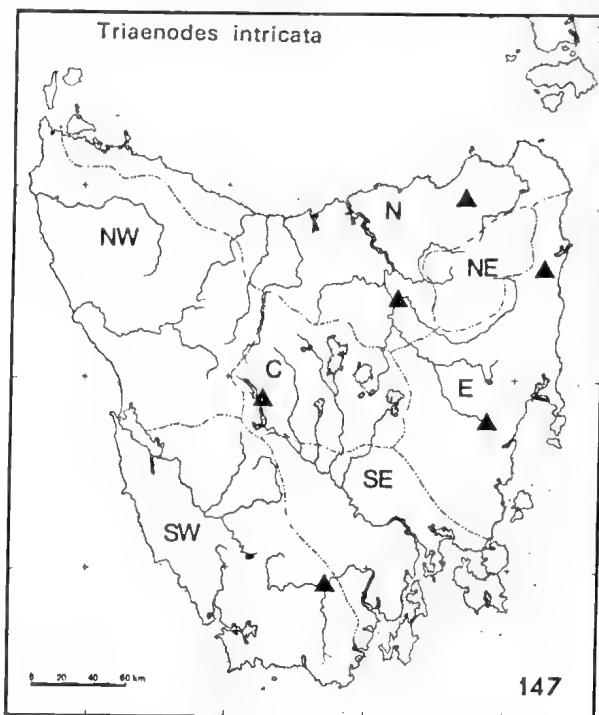
Figures 759-763

A slender, dark-brown species. In male, the upper surface of basal antennal segment with a long, flat, somewhat spatulate, scale-like process, near the base of which arises a group of long hairs; in female, the basal antennal segment is simple but of similar shape and length.

♂ genitalia with upper margin of segment 9 produced into a pair of small, flattened processes and a long central rod-like projection; segment 10 formed by a pair of asymmetric, gradually tapered processes, the one on right side curved, tusk-like. Phallus narrow at base, widened distally. Inferior appendages complex with a pair of long, slender, curved processes arising from the base; the distal portion with broad, spiny, upper lobe and a curved, pointed, latero-distal angle.

♀ abdomen terminates with short, triangular dorsal plate and a pair of large, rounded lateral lobes.

**Length of anterior wing:** ♂ 7-8 mm; ♀ 7.5-8 mm.



**Type material:** Holotype ♂ (T5469), allotype ♀ (T5470), 5 ♂ 10 ♀ paratypes (T5471-T5485) South Esk River, Evandale, Tas., 1 Mar. 1967, A. Neboiss (NMV); 1 ♂ 1 ♀ paratypes (T5486-T5487) Grt. Forester River 5 km NW Forester, Tas., 11 Nov. 1972, A. Neboiss (NMV); 1 ♂ paratype (T5488) Huon-Picton River junction, Tas., 18 Feb. 1967, A. Neboiss (NMV); 1 ♂ 5 ♀ paratypes, Evandale, Tas., 1 Mar. 1967, E. F. Riek (ANIC).

**Other material examined:** Tasmania—1 ♀ Scamander River, Upper Scamander, 9 Nov. 1972, A. Neboiss (NMV); 3 ♀ Derwent River 2 km NW Derwent Bridge, 12 Feb. 1971, A. Neboiss (NMV); 4 ♂ 1 ♀ Tooms Lake, 4 Dec. 1974, A. Neboiss (NMV).

**Distribution:** Tasmania—SW, C, N and E provinces.

### Genus *Oecetis* McLachlan

*Oecetis* McLachlan, 1877:329; Mosely and Kimmins, 1953:281; Fisher, 1966:106 (list of references and synonymies).

*Type species: Leptocerus ochraceus* Curtis, 1825.

Antennae long, slender, slightly longer than the anterior wings in females, to more than twice their length in males of some species; segment 1 about as long or slightly longer than the diameter of eye; segment 2 short, segment 3 and the subsequent ones long and slender. Anterior wings long and narrow; Sc connected to  $R_1$  by thickened cross-vein; thickening of  $R_1$  from cross-vein gradually decreasing towards the wing margin; discoidal cell closed; forks 1 and 5 present. Posterior wings narrow, forks 1 and 5 present.

Spurs 0:2:2, 1:2:2 or 2:2:2.

This world-wide genus in Australia is represented by two very distinct species groups—the *minasata* group which has the fork 1 in anterior wing with footstalk and the *australis* group, with fork 1 sessile in anterior wing. To the *australis* group belong the Australian species *australis* (Banks), *pechana* (Mosely), *lurida* (Kimmins) and two new species *gilva* and *umbra*, described in this paper; also the New Zealand species *unicolor* (McLachlan), *iti* (McFarlane), *chatamensis* (Tillyard) and the Papuan species *squamosa* (Kimmins).

A number of generic names have been proposed for various groups of species, but they have all been placed into synonymy with *Oecetis*. No attempt is made here to relate Tasmanian species to any other than those on the Australian mainland; as there is a number of undescribed species, other grouping might later be recognized.

The spurs on anterior legs sometimes are very small. The differences between *chatamensis*, *unicolor* and *umbra* is found mainly in the shape of the inferior appendages.

#### KEY FOR SEPARATING TASMANIAN SPECIES (Males only)

1. Anterior wing with fork 1 sessile (*australis* group) . . . . . 2
- Anterior wing — fork 1 with footstalk (*minasata* group) . . . . . 5
2. Inferior appendages with upper margin produced into a distinct process; lower

margin divided, mid-ventral angle produced into a slender finger-like

- process . . . . . *australis*
- Inferior appendages with upper margin forming rounded lobe; lower margin not divided . . . . . 3
3. Central area of anterior wing with patch of scale-like hairs . . . . . 4
- Central area of anterior wing without patch of scale-like hairs . . . . . *gilva*
4. Inferior appendages in lateral view with lower margin obtuse; parameres long . . . . . *pechana*
- Inferior appendages in lateral view with lower margin produced distally; parameres short . . . . . *umbra*
5. Cross-vein r-m at approximately the same level as the cross-vein closing discoidal cell . . . . . 6
- Cross-vein about its own length distad from cross-vein closing discoidal cell . . . . . *arcada*
6. Spurs 0:2:2 . . . . . 7
- Spurs 1:2:2 or 2:2:2 . . . . . 8
7. In male, segment 10 about twice as long as superior appendage . . . . . *asmanista*
- In male, segment 10 about as long or only slightly longer than superior appendage . . . . . *minasata*
8. Spurs 1:2:2 . . . . . 9
- Spurs 2:2:2 . . . . . *scirpicula*
9. Anterior wing mottled; cross-vein r-m and m-cu at the same level . . . . . *laustra*
- Anterior wing with dark, longitudinal lines; cross-vein m-cu basad of cross-vein r-m . . . . . *inscripta*

#### 148 *Oecetis pechana* Mosely Figures 764-769

*Oecetis pechana* Mosely in Mosely and Kimmins, 1953:302.

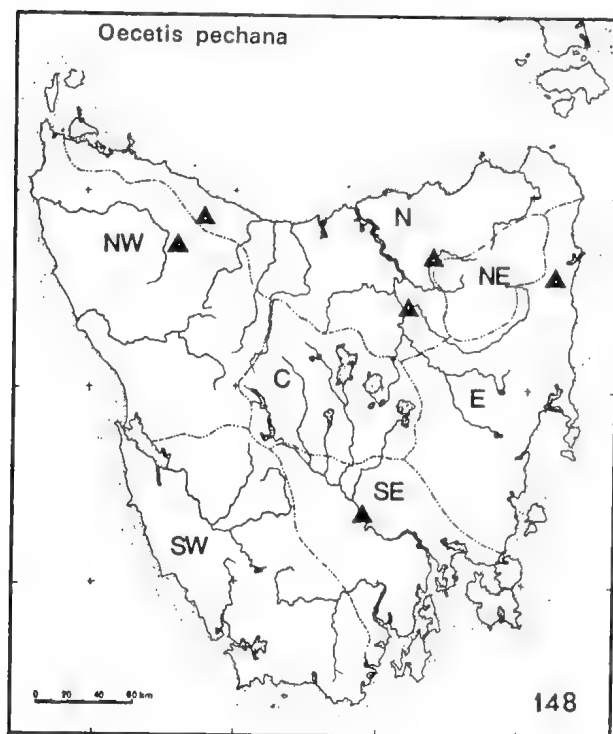
Anterior wings brown, with dark brown spots at vein junctions, the central area of the wing in males covered with brown scales. Posterior wings narrow, apically acute. Spurs 1:2:2.



♂ genitalia with segment 9 slightly produced mid-dorsally, distal margin developed into a pair of rounded lobes. Segment 10 in shape of elongate, membranous plate, triangular apically with a short, vertical ridge. Phallus membranous, parameres very long, slightly curved, pointed apically. Inferior appendage short and broad, upper lobe rounded and curved inward.

♀ abdomen terminates bluntly, lateral lobes rounded apically; central tubular piece with dorsal margin apically excised.

*Length of anterior wing:* ♂ 9-10.5 mm; ♀ 8-11 mm.



*Type material:* Type ♂ Yanchep, W.A., 20-31 Dec. 1935, R. E. Turner (BMNH). Type not seen.

*Material examined:* Tasmania—2 ♂ 3 ♀ South Esk River, Evandale, 1 Mar. 1967; 1 ♂ Bushy Park, 23 Feb. 1967; 1 ♀ Guide River Falls nr. Ridgley, 18 Nov. 1971; 1 ♀ St. Patricks River, Targa, 22 Feb. 1971; 1 ♂ 3 ♀ Scamander River, Upper Scamander, 9 Nov. 1972; 5 ♀ Hellyer River Gorge, 9 Feb. 1971. All specimens collected by A. Neboiss (NMV).

*Distribution:* Tasmania—E, N, NW and SE provinces; Victoria; New South Wales; Queensland; Western Australia.

# 149 *Oecetis umbra* sp. n.

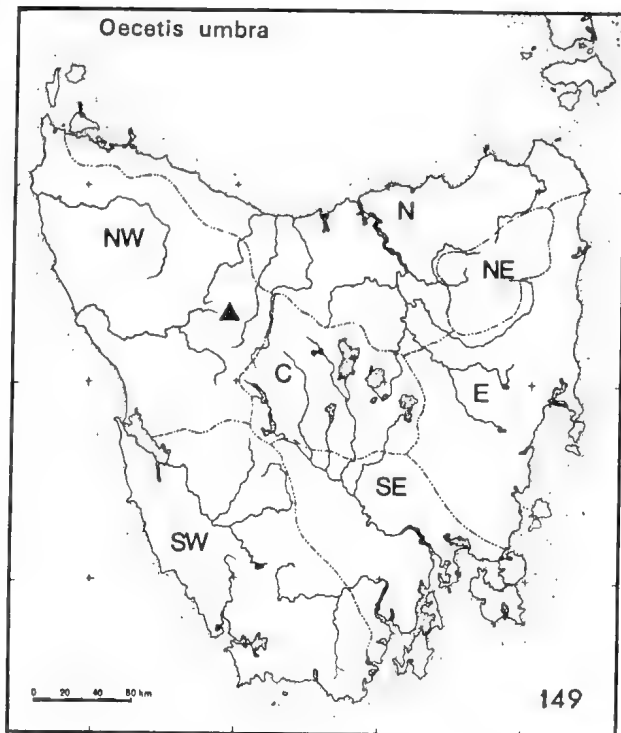
Figures 770-773

Anterior wings greyish-brown, small groups of dark hairs on vein junctions, but less distinct than those in *pechana*. In male the central area of anterior wing just below discoidal cell covered with patch of dark scales. Spurs 1:2:2.

♂ genitalia very similar to *unicolor* and *chatamensis*, but differs by having a more pronounced, longer, finger-like process on the inner, upper margin of the inferior appendage. Phallus short, apex truncate with downturned ventral ridge; parameres asymmetric, short, acute apically.

♀ genitalia similar to that of *pechana* but upper margin of tubular piece not distinctly excised.

*Length of anterior wing:* ♂ 12 mm; ♀ 10.5 mm.



*Type material:* Holotype ♂ (T5489), allotype ♀ (T5490) Waldheim, Cradle Mtn. Nat. Park, Tas., 7 Feb. 1971, A. Neboiss (NMV).

*Distribution:* Tasmania—NW province.

150 *Oecetis gilva* sp. n.

Figures 774-776

The species is of overall light, reddish-brown colour. Anterior wings rounded apically; both cross-veins below discoidal cell are equally far basad from the cross-vein closing discoidal cell. The wing membrane around vein junctions and cross-veins pigmented dark; in males there are no scale-like hairs at the centre of anterior wings. Spurs 1:2:2.

♂ genitalia with middle of dorsal margin of segment 9 broadly rounded, a pair of small protuberances at the base just above dorsal lobes. Segment 10 in form of gradually tapering plate. Phallus short, lower margin produced into a downward directed acute projection, parameres short and pointed. Inferior appendages with upper margin broadly rounded.

♀ genitalia similar to that of *pechana* but central tubular piece less protruding distally. Length of anterior wing: ♂ 10-10.5 mm; ♀ 9.5 mm.

Distribution: Tasmania—N province.

151 *Oecetis australis* (Banks)

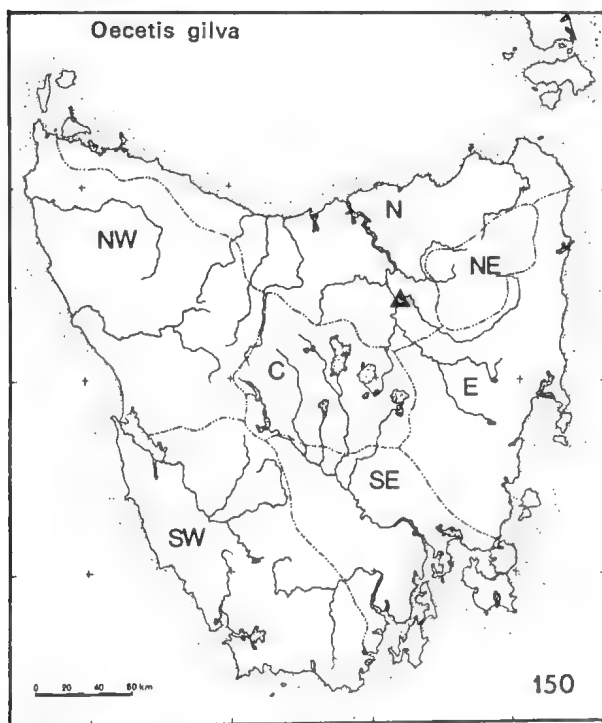
Figures 777-783

*Oecetina australis* Banks, 1920:350.

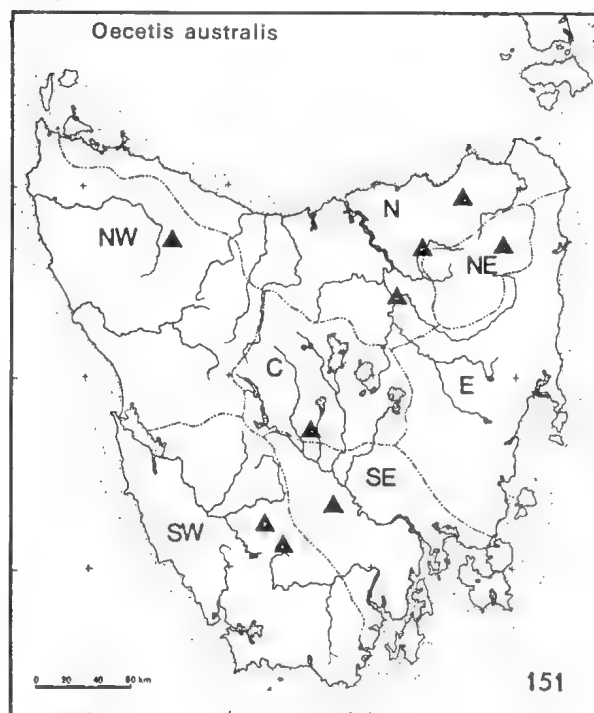
*Oecetis australis*, Mosely and Kimmins, 1953:305.

The anterior wing pattern is similar to that in *pechana*, but differs in some minute details, overall paler colour and absence of scale-like hairs in the male anterior wings. Tasmanian specimens, compared with the holotype ♂ of *australis*, show some difference in the shape of the upper lobe of the inferior appendages. Variations of this structure were observed also among the Victorian specimens. The darkened area at the base of the discoidal cell is flanked by pale, elongate spots basad and distal.

♂ genitalia with gradually tapering segment 10 at and above the base of which is a pair of oval lobes. Superior appendages dorso-ventrally flattened, rather long, in dorsal view apically clavate. Phallus membranous, paramere long, slender, apically bent at right angle. Inferior appendages ventrally separated by a V-shaped incision, central margin extended into a long, narrow projection, but lateral margin extended into two lobes, variable in shape.



Type material: Holotype ♂ (T5491), allotype ♀ (T5492), 7 ♂ 1 ♀ paratypes (T5493-T5500) South Esk River nr. Evandale, Tas., 1 Mar. 1967, A. Neboiss (NMV).



♀ abdomen terminates bluntly, lateral plate in side view with lower angle produced to a rounded lobe.

*Length of anterior wing:* ♂ 7-8 mm; ♀ 7-8.5 mm.

*Type material:* Holotype ♂ New Holland, Melbourne (Victoria), Thorey (ANIC). Type seen.

*Material examined:* Tasmania—1 ♂ St. Columba Falls, Pyengana, 21 Feb. 1971; 1 ♀ National Park, 20 Feb. 1967; 2 ♀ Huon River Crossing, 16 Feb. 1971; 1 ♀ South Esk River, Evandale, 1 Mar. 1967; 1 ♀ Great Forester River 5 km NW Forester, 11 Nov. 1972; 1 ♂ Bradys Lake, 27 Feb. 1967; 1 ♀ St. Patricks River, Targa, 22 Feb. 1971; 1 ♂ Wedge River, 17 Feb. 1971; 3 ♀ Hellyer River Gorge, 9 Feb. 1971. All specimens collected by A. Neboiss (NMV).

*Distribution:* Tasmania—NE, N, C, NW, SW and SE provinces; Victoria.

## 152 *Oecetis minasata* Mosely

Figures 784-787

*Oecetis minasata* Mosely in Mosely and Kimmins, 1953:282.

Anterior wings brownish, slightly darker, obliquely transversal line in the middle of wing at anastomosis, thyridial cell slightly longer than discoidal cell. Spurs 0:2:2.

♂ genitalia with segment 10 about as long or only slightly longer than superior appendages. Phallus directed downward, apex rounded. Inferior appendages broad at base, upper margin extended upward and terminating with inward directed hook.

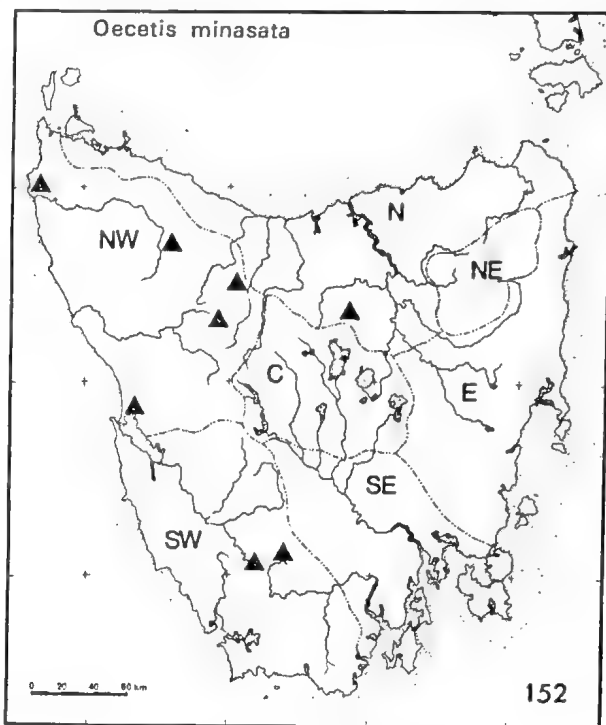
♀ abdomen in lateral view with triangular projection at the base of lateral plate, which has the lower margin produced downward into a rounded lobe.

*Length of anterior wing:* ♂ 6.5-7.5 mm; ♀ 7 mm.

*Type material:* Type ♂ 'Tasmania', J. W. Evans (BMNH). Type not seen.

*Material examined:* Tasmania—1 ♂ 5 ♀ Huon River Crossing, 16 Feb. 1971; 1 ♂ Lake Pedder, 31 Jan. 1965; 5 ♂ 1 ♀ Bluff Hill Creek 12 km S Marawah, 30 Nov. 1974; 1 ♂ Lake Lilla, Cradle Mtn. Nat. Park, 14 Dec. 1974; 1 ♂ Bull Creek Cradle Mtn. Road, 13 Dec. 1974; 1 ♀ Hellyer River Gorge, 12 Dec. 1974; 4 ♂ Liffey River 5 km W of Liffey, 2 Dec. 1974; 2 ♂ Hogarth Falls, Strahan, 10 Dec. 1974. All specimens collected by A. Neboiss (NMV).

*Distribution:* Tasmania—N, NW and SW provinces.



## 153 *Oecetis laustra* Mosely

Figures 788-791

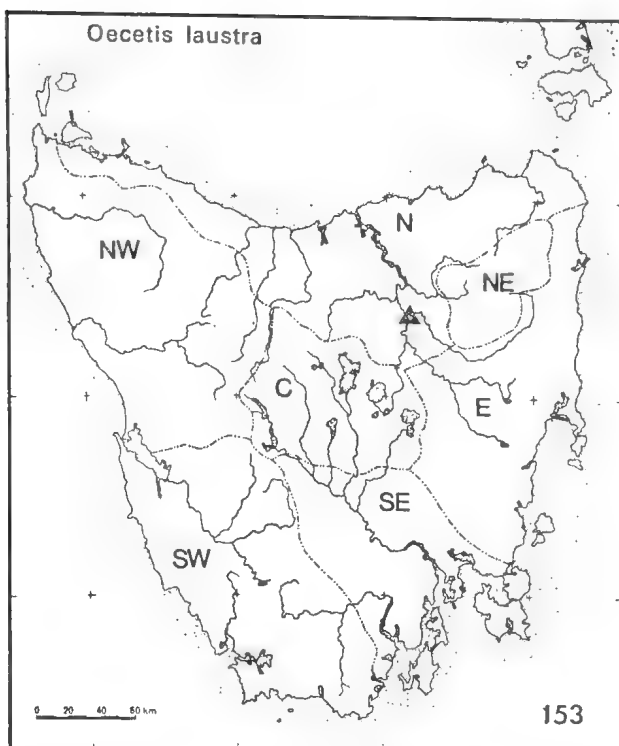
*Oecetis laustra* Mosely in Mosely and Kimmins, 1953: 295.

Anterior wings brownish with some mottling. The specimens from Tasmania differ slightly from those of Western Australia, but are still regarded as belonging to the same species. Spurs 1:2:2.

♂ genitalia with distal margin of tergite 9 produced in the middle. Superior appendages short, broadly triangular in lateral view. Segment 10 membranous, transparent, apex excised. Phallus stout, apical section abruptly bent downward. Inferior appendages broad, upper apical angle extended to a rounded, upwardly and inwardly curved lobe; the inner, lower margin smooth with a curved tooth on lower, inner angle (this margin slightly serrate in specimens from Western Australia).

♀ abdomen with distal margin of tergite 9 produced in the middle, truncate apically; on either side somewhat rectangular lobe; lateral plate slightly curved, lower angle produced down- and inward.

*Length of anterior wing:* ♂ 7-9 mm; ♀ 8-8.5 mm.



*Type material:* Type ♂ Yanchep, 32 mls N of Perth, W.A., 13-23 Nov. 1935, R. E. Turner (BMNH). Type not seen.

River nr. Evandale, 1 Mar. 1967, A. Neboiss (NMV); 3 ♂ same loc., 1 Mar. 1967, E. F. Riek (ANIC).

*Material examined:* Tasmania—3 ♂ 2 ♀ South Esk

*Distribution:* Tasmania—N province; Western Australia; Queensland.

#### 154 *Oecetis asmanista* Mosely

Figures 792-795

*Oecetis asmanista* Mosely in Mosely and Kimmins, 1953:282.

*Oecetis ochracea* Jacquemart, 1965b:23 non Curtis, 1825.

*Oecetis geevestonia* Neboiss, 1974c:15 *syn. nov.*

This species is similar to *minasata* but slightly larger in size; anterior wings brownish with darker oblique line at anastomosis, thyridial cell about the same length as discoidal cell. Spurs 0:2:2.

The species described by Jacquemart (1965b) as *ochracea*, was renamed *geevestonia* by Neboiss (1974c) because the name is pre-occupied by the type species *ochracea* Curtis 1825.

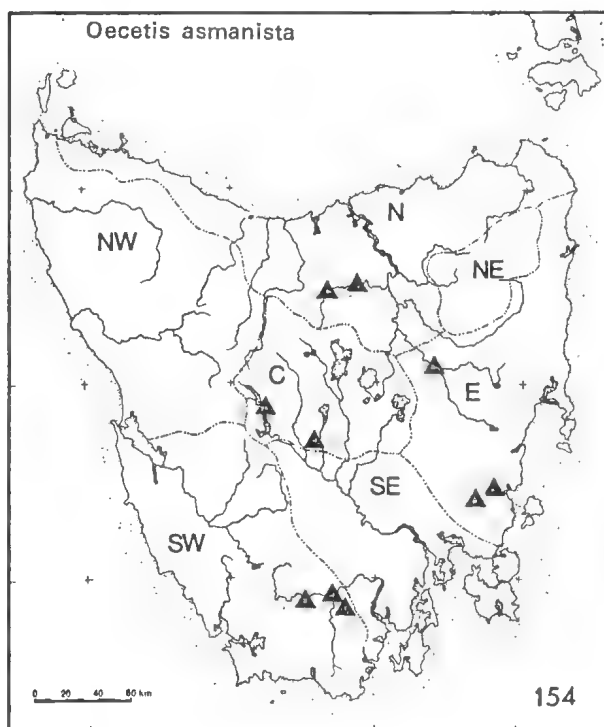
Comparing Jacquemart's type with the fig. 18 (Jacquemart, 1965b) several omissions were

detected in the drawings of wing venation; the lateral view of genitalia is shown with ventral side up. The differences between Jacquemart's species and *asmanista* are not substantiated and both species are regarded as synonymous.

♂ genitalia characterized by long and narrow segment 10, which is almost twice the length of superior appendages. Inferior appendages broad at base, distal section abruptly narrowed, turned inwards at apex and terminating with few short spines.

♀ abdomen with lateral plates somewhat rectangular, lower angle slightly produced downward.

*Length of anterior wing:* ♂ 7.5-9 mm; ♀ 8-8.5 mm.



*Type material:* Type ♂ Tasmania, J. W. Evans (without definite locality) (BMNH). Type not seen.

Holotype ♂ of *Oecetis ochracea* Jacquemart, Geeveston, Tas., 7 Dec. 1922, A. Tonnoir (IRScNB); dissected and mounted on three microscope slides. Type seen.

*Material examined:* Tasmania—5 ♂ 7 ♀ Prosser River nr. Orford, 13 Nov. 1972; 1 ♂ Prosser River 2 km W of Buckland, 7 Dec. 1974; 5 ♂ 10 ♀ Huon-Picton River junction, 18 Feb. 1967; 1 ♂ Huon River

nr. Blakes Opening, 9 Feb. 1966; 1 ♂ Derwent River 2 km NW Derwent Bridge, 12 Feb. 1971; 1 ♀ Bradys Lake, 27 Feb. 1967; 1 ♂ same loc., 9 Dec. 1974; 32 ♂ 16 ♀ Macquarie River 8 km W Campbell Town, 9 Nov. 1972; 2 ♂ 1 ♀ Meander River, Deloraine, 28 Nov. 1974; 1 ♂ 1 ♀ Meander River 3 km N of Westbury, 16 Dec. 1974. All specimens collected by A. Neboiss (NMV).

**Distribution:** Tasmania—E, N, C and SW provinces.

### 155 *Oecetis arcada* Mosely

Figures 796-800

*Oecetis arcada* Mosely in Mosely and Kimmins, 1953: 290.

*Oecetis albodecorata* Jacquemart, 1965b:23 *syn. nov.*

This brownish species is the only one in Tasmania with the cross-vein r-m situated its own length distad of the cross-vein closing discoidal cell. Small groups of darker hairs on cross-veins at anastomosis and on vein junctions on anterior wings, the intensity varies considerably from distinct to almost non existent. Spurs 1:2:2.

The types of both species *arcada* and *albo-decorata* came from Cradle Mountain area. The comparison of descriptions and figures of both, with specimens from the locality, leaves no doubt of their synonymy.

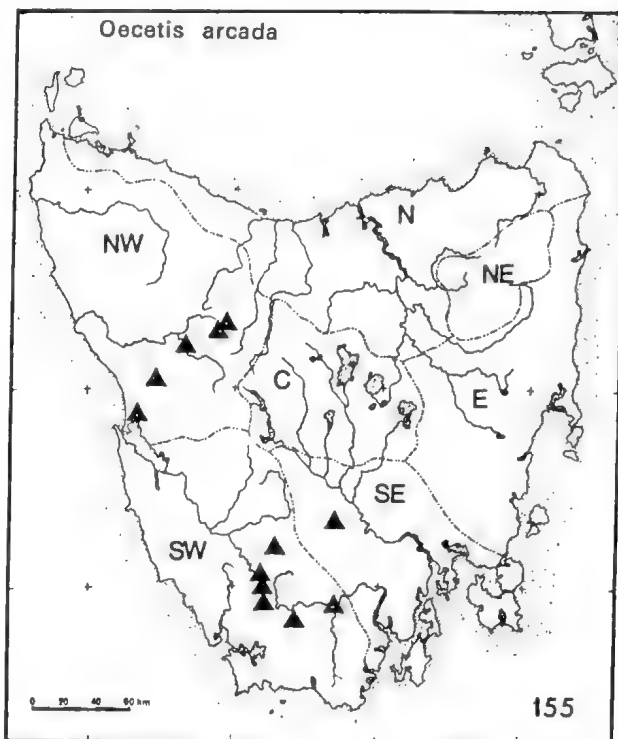
♂ genitalia with a pair of small tubercles just below the distal margin of tergite 9. Superior appendages elongate, rounded apically; the inner lateral margin of segment 9 produced to a short, inwardly directed acute process. Segment 10 short, membranous, transparent. Phallus short, robust, apex turned downwards at right angle. Inferior appendages robust, concave, ventral margin with an excision near apex.

♀ abdomen with distal margin of tergite 9 produced into short, bi-tuberculate process; upper lobes short and broad, the lateral lobes somewhat squarish.

**Length of anterior wing:** ♂ 6.5-8.5 mm; ♀ 7-8 mm.

**Type material:** Type ♂ Cradle Mtn., Tas., 16 Jan. 1917, R. J. Tillyard (BMNH). Type not seen.

*Oecetis albodecorata* Jacquemart holotype ♂ Lote Lilla (misspelling for Lake Lilla, Cradle Mtn.) 14 Jan. 1923, A. Tonnoir (IRScNB). Specimen dissected and mounted on three microscope slides. Type seen.



**Material examined:** 5 ♂ 19 ♀ Waldheim, Cradle Mtn. Nat. Park, 7 Feb. 1971; 12 ♂ 45 ♀ Huon-Picton River junction, 18 Feb. 1967 and 15 Nov. 1972; 1 ♀ Lake Dobson, 20 Feb. 1967; 2 ♂ Cracroft River, 8 Feb. 1966; 4 ♂ Wedge River, 17 Feb. 1971; 1 ♀ Huon Plains nr. Scotts Peak, 8 Feb. 1965; 1 ♂ West Arthur Plains, 1 Feb. 1965; 1 ♂ 1 ♀ Junction Creek West Arthur Plains, 7 Feb. 1966; 1 ♂ Lake Pedder, 31 Jan. 1965; 3 ♂ Hogarth Falls, Strahan, 10 Dec. 1974; 21 ♂ 4 ♀ Henty River 12 km NW Queenstown, 10 Feb. 1971. All specimens collected by A. Neboiss (NMV). 2 ♂ 4 ♀ Murchison River, 5 Feb. 1967, E. F. Riek (ANIC).

**Distribution:** Tasmania—NW, SW and SE provinces.

### 156 *Oecetis inscripta* Kimmins

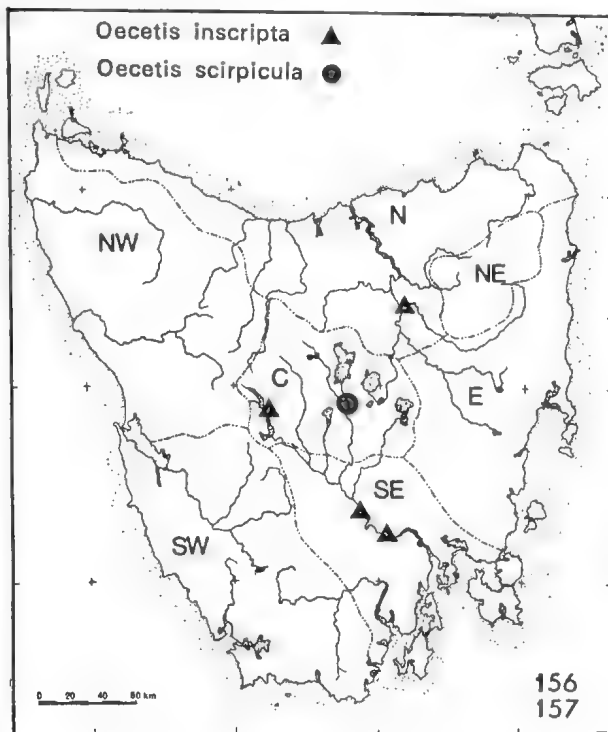
Figures 801-803

*Oecetis inscripta* Kimmins in Mosely and Kimmins, 1953:294.

The very distinctive pattern of dark, longitudinal lines on the anterior wing distinguishes this species and makes it easily recognizable. Spurs 1:2:2.

♂ genitalia with distal margin of tergite 9 produced in the middle; superior appendages short, ovate. Segment 10 membranous, transparent, deeply and widely cleft. Phallus short, curved downward, apex dilated, lower margin acute. Inferior appendages slender, upper

margin near the base elevated in an upwardly directed projection.



♀ abdomen terminates bluntly, lateral lobes small.

Length of anterior wing: ♂ 8-11 mm; ♀ 9-10 mm.

Type material: Type ♂ Bathurst, N.S.W., 2400 ft., 12 Nov. 1884, McLachlan Collection (BMNH). Type not seen.

Material examined: Tasmania—3 ♂ 8 ♀ South Esk River, Evandale, 1 Mar. 1967, A. Neboiss (NMV); 1 ♂ Derwent River 2 km NW Derwent Bridge, 12 Feb. 1971, A. Neboiss (NMV); 1 ♀ Bushy Park, 23 Feb. 1967, A. Neboiss (NMV); 1 ♀ Derwent River 3 km W of New Norfolk, 7 Dec. 1974, A. Neboiss (NMV); 4 ♂ 5 ♀ Evandale, 1 Mar. 1967, E. F. Riek (ANIC).

Distribution: Tasmania—N, C and SE provinces; New South Wales; Victoria.

### 157 *Oecetis scirpicula* sp. n.

Figures 804-807

A greyish-brown species, the darkening on anterior wing along cross-veins at anastomosis not distinctive. Spurs 2:2:2.

♂ genitalia with distal margin of tergite 9 elevated but not produced; superior appendages short, rounded apically. Segment 10 mem-

braneous, deeply cleft apically, a small, triangular tubercle on either side at the base. Phallus robust, curved downward. Inferior appendages broad at base, slender up-and-in-turned apically.

♀ abdomen with distal margin of tergite 9 only slightly produced, broadly triangular, and a pair of small tubercles in the middle, just below the margin; upper lobes rather large, rectangular; lateral lobes with lower margin flattened and distal angle produced.

Length of anterior wing: ♂ 9 mm; ♀ 9 mm.

Type material: Holotype ♂ (T5501), allotype ♀ (T5502) Penstock Lagoon, Tas., 27 Feb. 1967, A. Neboiss (NMV).

Distribution: Tasmania—C province.

## DISCUSSION

In their work on Australian and New Zealand Trichoptera Mosely and Kimmins (1953), listed 17 families of which only 13 were recorded from Tasmania. Since then a considerable number of changes has taken place in higher classification (Lepneva 1956, 1964; Ross 1967). Some families have been subdivided, new families described, and others replaced. The family classification adapted in this paper is that used by Malicky (1973), which is an amended version of that proposed by Ross (1967).

In the present study 21 families are recognized as occurring in Tasmania, although the position of three families—Calocidae, Helicophidae and Conoesucidae—might require further amendments when species from the Australian mainland are studied in more detail. During the last few years the following families have been added or their status changed.

Glossosomatidae—listed as a subfamily by Mosely and Kimmins (1953), but now regarded as a family by Ross (1967) and other authors.

Stenopsychidae—with the only Australian genus *Stenopsychodes* recorded from Tasmania for the first time in this paper.

Ecnomidae—previously a subfamily of Psychomyiidae, raised to family level by Lepneva (1956). Both Australian genera belong to Ecnomidae and therefore the family Psycho-

myidae *s. str.* is now omitted from the Australian fauna.

Kokiriidae—the family had recently been recognized in the Australian fauna (Neboiss 1974b), and is now known to be represented in Tasmania by three endemic species. The first apparent record by Bayly *et al.* (1972), of the genus similar to *Kokiria* from Lake Pedder, was based on a preliminary identification of material by the present author, which is fully described in this paper.

Tasimiidae—genus *Tasimia*, segregated from the Sericostomatidae by Rick (1968) to form a separate family.

Calocidae—genus *Caloca*, segregated from the Odontoceridae by Ross (1967) to form a new family; genus *Caenota* and *Tamasia* is now added to it. The New Zealand family Pycnocentrellidae is reduced to synonymy.

Oeconesidae—a group of New Zealand genera previously regarded as a tribe of the Sericostomatidae by Tillyard (1921), was raised to family rank by Neboiss (1975), when a new genus from Tasmania was added. This is the only family found in Tasmania, but not recorded from the Australian mainland.

Beraeidae—the only Australian genus placed in the family was *Alloecella* Banks, which is now transferred to the family Helicophidae; consequently, the family name Beraeidae is removed from the list of Australian and Tasmanian Trichoptera.

Conoesucidae—erected as a subfamily of the Sericostomatidae by Ross (1967), is raised in this publication to family rank. The main diagnostic features of the family are described and the names of all genera included are given. A number of other Australian genera, previously placed in the family Sericostomatidae, had already been transferred to other families (see p. 99), and as all the remaining ones belong to Conoesucidae, the family name Sericostomatidae had to be removed from the list of Tasmanian and Australian Trichoptera.

In Tasmania, there are now recorded a total of 66 genera with 157 species, which are placed in 21 families. Only two of these families contain more than 20 species each—Rhyacophilidae, with 29 species and Leptoceridae with 30 species. Both subfamilies of the Leptoceridae

have strong northern relationships, 13 of the 30 Tasmanian species are widespread on mainland Australia, and some have also been reported from SE Asian localities.

The family Rhyacophilidae is represented by two subfamilies—Apsilochoreminae and Hydrobiosinae. Apsilochoreminae, with only two species in Tasmania, both of which are also widely distributed on the Australian mainland, represent a group with strong, northern relationships. This subfamily is not known from New Zealand.

The second subfamily—Hydrobiosinae—is dominated by trans-antarctic distribution pattern and at present contains 27 Tasmanian species, of which only seven are shared with mainland Australia. There are no species common to both Tasmania and New Zealand. The distribution of Australian species was discussed and illustrated by Neboiss (1962:522), demonstrating that the largest number of species was concentrated in the southeast of the continent, with rapidly decreasing numbers in the northerly direction. The present investigation transfers the centre of concentration to Tasmania, emphasizing the southern origin of the group. The subfamily is represented with more than 50 species in New Zealand.

Several of the smaller families, most of them with very limited distribution, have typical trans-antarctic distribution patterns. To this group belong families Philopotamidae (genus *Hydrobiosella* only), Kokiriidae, Oeconesidae, Tasimiidae, Calocidae, Helicophidae, Conoesucidae and Philorheithridae, all of them are classified as cool adapted forms (*sensu* Ross 1956).

The available information on distribution shows that 116 species or 74% are endemic to Tasmania. Future, more extensive collecting in the southeastern part of the Australian mainland, particularly in Victoria, quite likely will reveal that some of them have wider range of distribution, but nevertheless, Tasmania is far from being fully explored, and without doubt, a number of yet unknown species could be discovered. It is therefore reasonable to assume that the proportion between endemic and widespread species will remain quite close to the present level. The proportion of endemic species is similar to that found in other aquatic

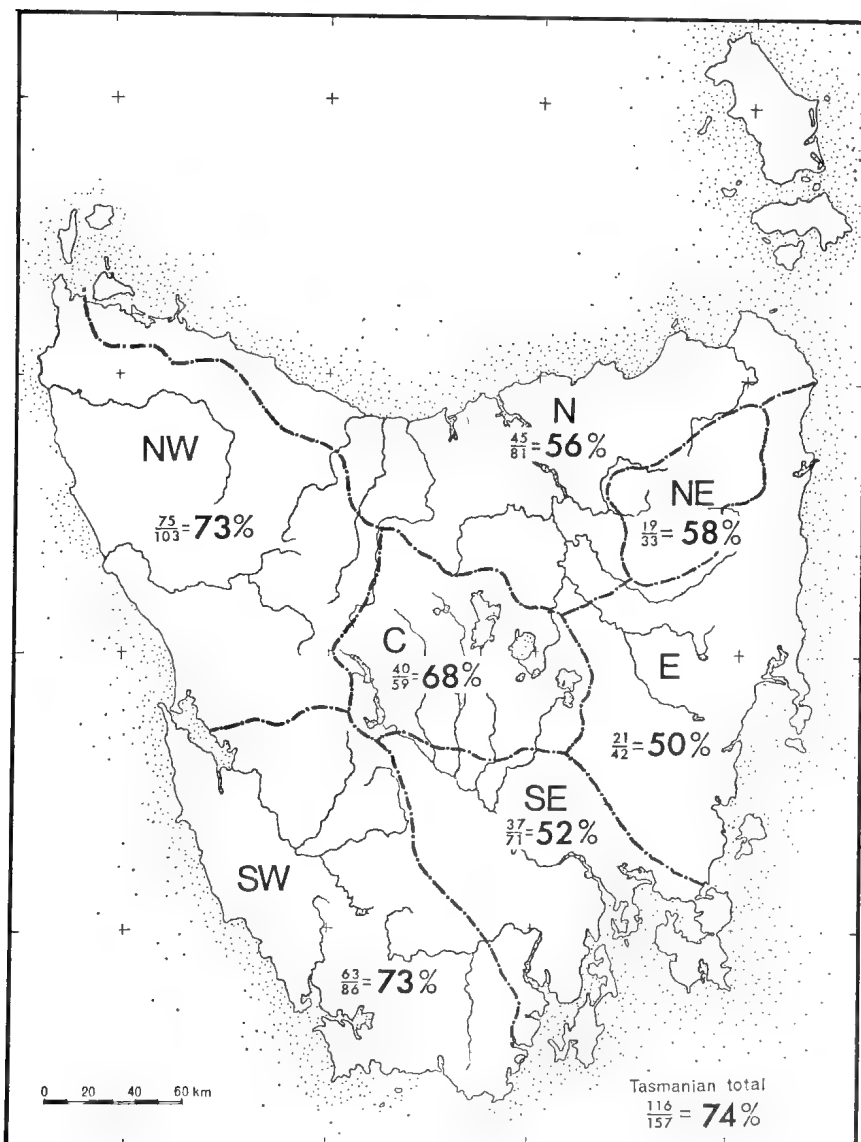


insect groups in Tasmania, e.g. Plecoptera (as high as 82%—Hynes, 1976). The above-mentioned figures disagree with the statement by Guiler (1965) that '... Tasmania, although once connected to the Australian continent, has very few endemics, both in its vertebrate and invertebrate fauna'.

Analysing individual provinces, it can be seen that not all of them have the same proportion of endemic species. Calculated from the total number of species recorded from each province, the highest proportion of Tasmanian endemics—as much as 73%—are found in the NW and SW provinces. In the NW province,

out of a total of 103 species, 75 are endemic, of which 14 are found only in this province. The lowest proportion of endemic species is in the E province, where, out of 42 recorded species, 21 or 50% are endemic to Tasmania, and only two of them are restricted to the province. A difference of more than 20% in endemic content between the two provinces seems large enough to be of some significance.

During the Pleistocene glacial phases, the sea level was substantially lower, which allowed formation of land bridge across the relatively shallow Bass Strait, connecting Victoria, from Wilsons Promontory over the Furneaux



Map 3—Endemism level of Tasmanian Trichoptera.

Group of islands, with NE Tasmania (Jennings, 1971). Recently accumulated evidence indicate that there has been more than one glacial phase in Tasmania (Davies, 1974), and the last such connection probably existed for a considerable length of time between 32 000 and 10 000 years before present.

It also has been established from the available geological evidence, that during the maximum of the last glaciation, Tasmania had a wet western region and a much dryer region in the east, essentially as at present (Davies, 1974). To a large extent this explains why the wide-

spread, warm adapted species, common to the Australian mainland and Tasmania, are found mainly NE of a line between Hobart and Burnie, which coincides with the dominance of sclerophyll forests (Vegetation map, Davies 1965). By contrast, the cooler and wetter conditions SW of the line, allowed uninterrupted persistence of the cool adapted, endemic species, coinciding with dominance of rainforests.

The total number of species, the number of endemic species and the percentage of endemics from the total, calculated from each province separately, are shown on Map 3.

#### CHECK LIST OF TASMANIAN TRICHOPTERA

##### SUPERFAMILY RHYACOPHILOIDEA

|  | N | NE | E | C | NW | SW | SE |
|--|---|----|---|---|----|----|----|
| 1. Fam. <b>Rhyacophilidae</b> Stephens |   |    |   |   |    |    |    |
| <i>Apsilochorema</i> Ulmer             |   |    |   |   |    |    |    |
| (1) <i>obliquum</i> (Mosely)           | X | X  |   | X | X  | X  | X  |
| (2) <i>gisbum</i> (Mosely)             | X | X  | X | X | X  | X  | X  |
| <i>Allochorema</i> Mosely              |   |    |   |   |    |    |    |
| (3) <i>tasmanicum</i> Mosely           |   |    |   | X | X  | X  | X  |
| <i>Austrochorema</i> Mosely            |   |    |   |   |    |    |    |
| (4) <i>pegidion</i> Neboiss            | X |    |   |   | X  | X  | X  |
| (5) <i>evansi</i> (Mosely)             |   |    |   |   |    |    | X  |
| (6) <i>crinitum</i> sp. n.             | X |    |   |   | X  |    |    |
| (7) <i>lepnevae</i> Jacquemart         |   |    |   |   | X  |    |    |
| (8) <i>complexa</i> Jacquemart         |   |    |   |   | X  |    |    |
| <i>Ipsobiosis</i> gen. n.              |   |    |   |   | X  | X  |    |
| (9) <i>spicula</i> sp. n.              | X |    |   | X | X  | X  | X  |
| <i>Ulmerochorema</i> Mosely            |   |    |   |   |    |    |    |
| (10) <i>breve</i> (Mosely)             |   | X  |   | X | X  | X  |    |
| (11) <i>seona</i> (Mosely)             | X |    |   | X | X  |    | X  |
| (12) <i>lentum</i> Neboiss             | X |    |   |   |    |    | X  |
| (13) <i>onychion</i> sp. n.            | X |    |   |   |    |    |    |
| (14) <i>tasmanicum</i> (Mosely)        | X |    | X | X | X  | X  | X  |
| (15) <i>rubiconum</i> Neboiss          | X | X  | X | X | X  | X  | X  |
| <i>Ethochorema</i> gen. n.             |   |    |   |   |    |    |    |
| (16) <i>secutum</i> sp. n.             |   |    |   |   | X  |    |    |
| (17) <i>nesydron</i> (Neboiss)         | X | X  |   | X | X  | X  | X  |
| (18) <i>kelion</i> sp. n.              |   |    |   |   | X  | X  |    |
| <i>Taschorema</i> Mosely               |   |    |   |   |    |    |    |
| (19) <i>asmanum</i> Mosely             | X | X  |   | X | X  | X  | X  |
| (20) <i>apobamum</i> sp. n.            | X | X  |   | X | X  | X  | X  |
| (21) <i>ferulum</i> sp. n.             | X | X  | X | X | X  | X  |    |
| (22) <i>viridarium</i> Neboiss         | X |    |   |   | X  | X  | X  |
| (23) <i>pedunculatum</i> Jacquemart    |   |    |   |   | X  | X  |    |
| (24) <i>evansi</i> Mosely              | X | X  | X | X | X  | X  | X  |
| <i>Ptychobiosis</i> gen. n.            |   |    |   |   |    |    |    |
| (25) <i>nigrita</i> (Banks)            | X |    | X |   | X  | X  | X  |
| <i>Koetonga</i> Neboiss                |   |    |   |   |    |    |    |
| (26) <i>clivicola</i> Neboiss          | X |    |   |   | X  | X  |    |
| <i>Moruya</i> Neboiss                  |   |    |   |   |    |    |    |
| (27) <i>charadra</i> Neboiss           |   | X  |   | X | X  | X  | X  |
| (28) <i>opora</i> Neboiss              |   |    |   | X | X  | X  |    |
| (29) <i>tasmanica</i> (Jacquemart)     |   |    |   | X | X  |    |    |
| 2. Fam. <b>Glossosomatidae</b> Ulmer   |   |    |   |   |    |    |    |
| <i>Agapetus</i> Curtis                 |   |    |   |   |    |    |    |
| (30) <i>tasmanicus</i> (Mosely)        | X | X  | X | X | X  | X  | X  |
| (31) <i>cralus</i> (Mosely)            | X |    |   | X | X  | X  | X  |
| (32) <i>laparus</i> sp. n.             |   |    |   |   |    | X  |    |

|                                       | N | NE | E | C | NW | SW | SE |
|---------------------------------------|---|----|---|---|----|----|----|
| 3. Fam. <b>Hydroptilidae</b> Stephens |   |    |   |   |    |    |    |
| <i>Orphninostrichia</i> Mosely        |   |    |   |   |    |    |    |
| (33) <i>acta</i> sp. n.               | X |    |   |   |    |    |    |
| <i>Hydroptila</i> Dalman              |   |    |   |   |    |    |    |
| (34) <i>tasmanica</i> Mosely          | X |    |   |   |    |    |    |
| (35) <i>scamandra</i> sp. n.          |   |    | X |   |    |    |    |
| <i>Targatrichia</i> gen. n.           |   |    |   |   |    |    |    |
| (36) <i>zonata</i> sp. n.             | X | X  |   | X | X  | X  | X  |
| <i>Hellyethira</i> gen. n.            |   |    |   |   |    |    |    |
| (37) <i>valleculea</i> sp. n.         | X |    | X |   | X  | X  |    |
| <i>Trichoglène</i> gen. n.            |   |    |   |   |    |    |    |
| (38) <i>columba</i> sp. n.            |   |    | X |   | X  | X  |    |
| <i>Maydenoptila</i> gen. n.           |   |    |   |   |    |    |    |
| (39) <i>cuneola</i> sp. n.            |   |    | X |   | X  | X  |    |
| (40) <i>rupina</i> sp. n.             | X |    | X |   |    |    |    |

## SUPERFAMILY HYDROPSYCHOIDEA

|  |   |   |   |   |   |   |   |
|--|---|---|---|---|---|---|---|
| 4. Fam. <b>Philopotamidae</b> Wallengren |   |   |   |   |   |   |   |
| <i>Hydrobiosella</i> Tillyard            |   |   |   |   |   |   |   |
| (41) <i>corinna</i> sp. n.               |   |   |   |   | X |   |   |
| (42) <i>orba</i> sp. n.                  |   |   |   |   |   | X |   |
| (43) <i>cerula</i> sp. n.                |   |   |   |   |   | X |   |
| (44) <i>anasina</i> sp. n.               | X |   |   |   | X |   |   |
| (45) <i>tasmanica</i> Mosely             |   |   |   |   |   | X | X |
| (46) <i>armata</i> Jacquemart            |   |   |   |   |   |   | X |
| (47) <i>cognata</i> Kimmins              | X |   |   | X | X |   |   |
| (48) <i>sagitta</i> sp. n.               |   | X |   |   |   |   |   |
| (49) <i>waddama</i> Mosely               | X | X |   | X | X | X | X |
| 5. Fam. <b>Stenopsychidae</b> Martynov   |   |   |   |   |   |   |   |
| <i>Stenopsychodes</i> Ulmer              |   |   |   |   |   |   |   |
| (50) <i>lineata</i> sp. n.               |   |   |   |   | X |   |   |
| 6. Fam. <b>Ecnomidae</b> Ulmer           |   |   |   |   |   |   |   |
| <i>Ecnomus</i> McLachlan                 |   |   |   |   |   |   |   |
| (51) <i>tillyardi</i> Mosely             | X |   | X | X | X | X | X |
| (52) <i>russellius</i> sp. n.            | X |   | X |   | X |   | X |
| (53) <i>continentalis</i> Ulmer          | X |   |   |   |   |   |   |
| <i>Ecnomina</i> Kimmins                  |   |   |   |   |   |   |   |
| (54) <i>irrorata</i> Kimmins             | X |   | X | X | X | X | X |
| (55) <i>legula</i> sp. n.                | X |   |   |   | X | X |   |
| (56) <i>vega</i> sp. n.                  |   |   | X |   |   |   |   |
| (57) <i>batyle</i> sp. n.                | X |   |   | X |   |   |   |
| 7. Fam. <b>Polycentropodidae</b> Ulmer   |   |   |   |   |   |   |   |
| <i>Plectrocnemia</i> Stephens            |   |   |   |   |   |   |   |
| (58) <i>altera</i> sp. n.                | X | X | X | X | X | X |   |
| (59) <i>lacuna</i> sp. n.                | X |   | X |   |   |   | X |
| (60) <i>manicata</i> sp. n.              |   |   |   |   | X | X |   |
| (61) <i>caudata</i> sp. n.               |   |   |   |   | X | X |   |
| <i>Tasmanoplegas</i> gen. n.             |   |   |   |   |   |   |   |
| (62) <i>spilota</i> sp. n.               |   |   |   |   | X | X |   |
| <i>Nyctiophylax</i> Brauer               |   |   |   |   |   |   |   |
| (63) <i>repandus</i> sp. n.              |   | X | X |   |   | X |   |
| 8. Fam. <b>Hydropsychidae</b> Curtis     |   |   |   |   |   |   |   |
| <i>Cheumatopsyche</i> Wallengren         |   |   |   |   |   |   |   |
| (64) <i>modica</i> (McLachlan)           | X |   | X | X | X |   | X |
| <i>Smicrophylax</i> gen. n.              |   |   |   |   |   |   |   |
| (65) <i>creektona</i> sp. n.             |   |   |   |   | X | X | X |
| (66) <i>simplex</i> (Jacquemart)         |   |   |   |   | X |   |   |
| <i>Asmicridea</i> Mosely                 |   |   |   |   |   |   |   |
| (67) <i>edwardsi</i> (McLachlan)         | X | X | X | X | X | X | X |
| (68) <i>grisea</i> (Mosely)              |   |   |   | X |   |   |   |
| <i>Diplectrona</i> Westwood              |   |   |   |   |   |   |   |
| (69) <i>castanea</i> Kimmins             |   |   |   |   |   |   | X |
| (70) <i>lyella</i> sp. n.                |   |   |   |   |   | X |   |
| (71) <i>bispinosa</i> Jacquemart         | X |   |   |   |   |   |   |
| (72) <i>tasmanica</i> Jacquemart         |   |   |   |   | X |   |   |

## SUPERFAMILY LIMNEPHILOIDEA

9. Fam. **Plectrotarsidae** Mosely

|  | N | NE | E | C | NW | SW | SE |
|--|---|----|---|---|----|----|----|
| <i>Plectrotarsus</i> Kolenati          |   |    |   |   |    |    |    |
| (73) <i>gravenhorsti</i> Kolenati      | X |    |   |   | X  |    | X  |
| (74) <i>tasmanicus</i> Mosely          |   |    |   | X | X  | X  |    |
| <i>Liapota</i> Neboiss                 |   |    |   |   |    |    |    |
| (75) <i>lavara</i> Neboiss             |   |    |   |   | X  | X  |    |
| <i>Nanoplectrus</i> gen. n.            |   |    |   |   |    |    |    |
| (76) <i>truchanasi</i> sp. n.          |   |    |   |   |    | X  |    |
| 10. Fam. <b>Limnephilidae</b> Kolenati |   |    |   |   |    |    |    |
| <i>Archaeophylax</i> Kimmins           |   |    |   |   |    |    |    |
| (77) <i>ochreus</i> Mosely             | X | X  |   | X | X  | X  | X  |
| (78) <i>vernalis</i> sp. n.            |   |    |   |   |    | X  |    |
| 11. Fam. <b>Kokiriidae</b> McFarlane   |   |    |   |   |    |    |    |
| <i>Taskiria</i> gen. n.                |   |    |   |   |    |    |    |
| (79) <i>austera</i> sp. n.             |   |    |   |   | X  | X  |    |
| (80) <i>mccubbini</i> sp. n.           |   |    |   |   |    | X  |    |
| <i>Taskiropsyche</i> gen. n.           |   |    |   |   |    |    |    |
| (81) <i>lacustris</i> sp. n.           |   |    |   |   |    | X  |    |
| 12. Fam. <b>Oeconesidae</b> Tillyard   |   |    |   |   |    |    |    |
| <i>Tascuna</i> Neboiss                 |   |    |   |   |    |    |    |
| (82) <i>ignota</i> Neboiss             |   |    |   |   | X  |    |    |
| 13. Fam. <b>Tasimiidae</b> Riek        |   |    |   |   |    |    |    |
| <i>Tasimia</i> Mosely                  |   |    |   |   |    |    |    |
| (83) <i>palpata</i> Mosely             | X |    | X | X | X  |    |    |
| (84) <i>denticulata</i> Jacquemart     |   | X  |   |   |    |    | X  |
| (85) <i>drepana</i> sp. n.             |   |    |   |   |    | X  |    |
| <i>Tasiagma</i> gen. n.                |   |    |   |   |    |    |    |
| (86) <i>ciliata</i> sp. n.             | X |    | X |   |    |    | X  |
| 14. Fam. <b>Helicopsychidae</b> Ulmer  |   |    |   |   |    |    |    |
| <i>Helicopsyche</i> Siebold            |   |    |   |   |    |    |    |
| (87) <i>bartona</i> Mosely             | X |    |   | X | X  |    | X  |
| (88) <i>murrumba</i> Mosely            | X |    | X |   |    |    | X  |
| 15. Fam. <b>Calocidae</b> Ross         |   |    |   |   |    |    |    |
| <i>Caloca</i> Mosely                   |   |    |   |   |    |    |    |
| (89) <i>tertia</i> Mosely              |   |    |   |   |    |    | X  |
| (90) <i>saneva</i> (Mosely)            |   |    |   |   | X  | X  | X  |
| (91) <i>ascita</i> sp. n.              |   |    |   | X |    |    |    |
| <i>Caenota</i> Mosely                  |   |    |   |   |    |    |    |
| (92) <i>plicata</i> Mosely             | X | X  |   |   | X  | X  | X  |
| <i>Tamasia</i> Mosely                  |   |    |   |   |    |    |    |
| (93) <i>variegata</i> Mosely           | X | X  | X | X | X  |    | X  |
| 16. Fam. <b>Helicophidae</b> Mosely    |   |    |   |   |    |    |    |
| <i>Helicopha</i> Mosely                |   |    |   |   |    |    |    |
| (94) <i>astia</i> Mosely               |   |    |   |   |    |    | X  |
| (95) <i>delamarei</i> Jacquemart       |   |    |   |   | X  |    |    |
| <i>Alloecella</i> Banks                |   |    |   |   |    |    |    |
| (96) <i>grisea</i> Banks               | X | X  |   |   | X  | X  | X  |
| (97) <i>longispina</i> Jacquemart      | X |    |   | X | X  | X  | X  |
| (98) <i>pilosa</i> sp. n.              | X |    |   |   | X  | X  | X  |
| 17. Fam. <b>Conoesucidae</b> Ross      |   |    |   |   |    |    |    |
| <i>Hampa</i> Mosely                    |   |    |   |   |    |    |    |
| (99) <i>patona</i> Mosely              | X | X  |   |   | X  | X  | X  |
| <i>Matasia</i> Mosely                  |   |    |   |   |    |    |    |
| (100) <i>satana</i> Mosely             | X |    |   | X |    | X  | X  |
| <i>Costora</i> Mosely                  |   |    |   |   |    |    |    |
| (101) <i>iena</i> Mosely               |   |    |   | X |    |    |    |
| (102) <i>delora</i> Mosely             | X |    | X |   |    |    |    |
| (103) <i>ebenina</i> sp. n.            | X |    |   | X | X  |    | X  |
| (104) <i>ramosa</i> Jacquemart         |   |    |   |   | X  |    | X  |
| (105) <i>krene</i> sp. n.              |   |    |   |   |    | X  |    |
| (106) <i>seposita</i> sp. n.           | X |    |   |   |    |    |    |
| (107) <i>luxata</i> sp. n.             |   |    |   |   | X  |    |    |
| (108) <i>rotoasca</i> Mosely           |   |    |   | X |    | X  |    |
| <i>Lingora</i> Mosely                  |   |    |   |   |    |    |    |
| (109) <i>aurata</i> Mosely             | X |    | X | X | X  |    | X  |
| (110) <i>vesca</i> sp. n.              |   | X  |   |   |    |    |    |
| <i>Conoesucus</i> Mosely               |   |    |   |   |    |    |    |
| (111) <i>fromus</i> Mosely             | X | X  |   | X | X  |    |    |
| (112) <i>norelus</i> Mosely            | X | X  | X | X | X  | X  | X  |

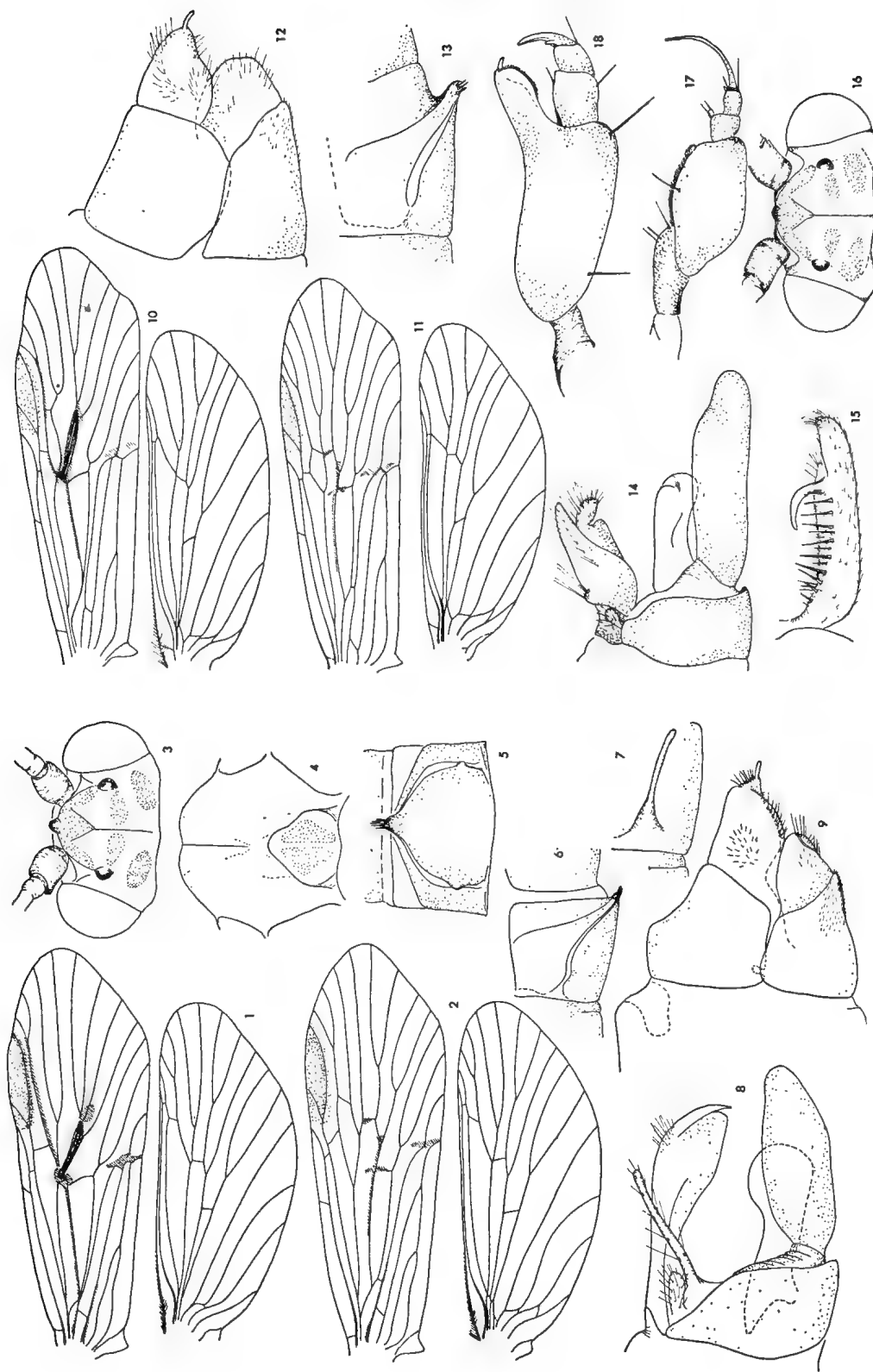
|  | N | NE | E | C | NW | SW | SE |
|--|---|----|---|---|----|----|----|
| (113) <i>digitiferus</i> Jacquemart      |   |    |   |   | X  |    |    |
| (114) <i>nepotulus</i> sp. n.            | X |    |   |   | X  | X  | X  |
| (115) <i>brontensis</i> sp. n.           | X |    |   | X | X  |    |    |
| 18. Fam. <b>Odontoceridae</b> Wallengren |   |    |   |   |    |    |    |
| <i>Atriplectides</i> Mosely              |   |    |   |   |    |    |    |
| (116) <i>dubia</i> Mosely                | X |    | X | X | X  | X  | X  |
| 19. Fam. <b>Calomoseriatidae</b> Ulmer   |   |    |   |   |    |    |    |
| <i>Anisocentropus</i> McLachlan          |   |    |   |   |    |    |    |
| (117) <i>latifascia</i> (Walker)         | X |    | X |   |    |    | X  |
| 20. Fam. <b>Philorheithridae</b> Mosely  |   |    |   |   |    |    |    |
| <i>Austrheithrus</i> Mosely              |   |    |   |   |    |    |    |
| (118) <i>ronewa</i> Mosely               | X |    | X |   | X  |    | X  |
| (119) <i>glymma</i> sp. n.               | X | X  |   |   | X  | X  |    |
| <i>Kosrheithrus</i> Mosely               |   |    |   |   |    |    |    |
| (120) <i>remulus</i> sp. n.              |   | X  |   |   | X  |    | X  |
| <i>Ramiheithrus</i> Neboiss              |   |    |   |   |    |    |    |
| (121) <i>kocinus</i> Neboiss             |   |    |   |   | X  |    |    |
| <i>Aphilorheithrus</i> Mosely            |   |    |   |   |    |    |    |
| (122) <i>stepheni</i> Mosely             | X | X  | X | X | X  | X  | X  |
| (123) <i>pauxillus</i> sp. n.            |   | X  |   |   | X  |    |    |
| (124) <i>decoratus</i> sp. n.            |   |    |   |   | X  | X  |    |
| (125) <i>luteolus</i> sp. n.             |   |    |   |   |    | X  |    |
| <i>Tasmanthrus</i> Mosely                |   |    |   |   |    |    |    |
| (126) <i>angustipennis</i> Mosely        | X |    | X | X | X  | X  | X  |
| 21. Fam. <b>Leptoceridae</b> Leach       |   |    |   |   |    |    |    |
| <i>Westriplectes</i> gen. n.             |   |    |   |   |    |    |    |
| (127) <i>pedderensis</i> sp. n.          |   |    |   |   |    | X  |    |
| <i>Triplectides</i> Kolenati             |   |    |   |   |    |    |    |
| (128) <i>ciuskus</i> Mosely              | X |    | X |   | X  | X  | X  |
| (129) <i>magnus</i> (Walker)             |   |    |   |   |    | X  | X  |
| (130) <i>similis</i> Mosely              | X | X  |   |   | X  | X  |    |
| (131) <i>truncatus</i> sp. n.            |   |    |   |   | X  |    |    |
| (132) <i>bilobus</i> sp. n.              |   |    |   | X | X  | X  |    |
| (133) <i>proximus</i> sp. n.             | X | X  |   |   |    |    | X  |
| (134) <i>elongatus</i> Banks             |   |    | X | X | X  |    |    |
| <i>Notoperata</i> gen. n.                |   |    |   |   |    |    |    |
| (135) <i>sparsa</i> (Kimmins)            |   |    |   |   | X  | X  |    |
| (136) <i>maculata</i> (Mosely)           |   |    |   | X | X  | X  | X  |
| <i>Symphitoneuria</i> Ulmer              |   |    |   |   |    |    |    |
| (137) <i>opposita</i> (Walker)           |   |    | X | X |    |    | X  |
| <i>Triplectidina</i> Mosely              |   |    |   |   |    |    |    |
| (138) <i>nigricornis</i> Mosely          |   |    |   | X | X  | X  |    |
| <i>Lectrides</i> Mosely                  |   |    |   |   |    |    |    |
| (139) <i>variatus</i> Mosely             | X |    |   |   | X  | X  | X  |
| <i>Notalina</i> Mosely                   |   |    |   |   |    |    |    |
| (140) <i>parkeri</i> Mosely              |   |    |   | X | X  |    |    |
| (141) <i>fulva</i> Kimmins               | X |    | X | X | X  | X  | X  |
| (142) <i>tillyardi</i> Kimmins           | X |    |   |   |    |    |    |
| (143) <i>bifaria</i> sp. n.              | X |    |   | X | X  | X  | X  |
| (144) <i>nigra</i> (Mosely)              |   |    | X | X | X  |    |    |
| <i>Condocerus</i> gen. n.                |   |    |   |   |    |    |    |
| (145) <i>paludosus</i> sp. n.            | X |    |   |   | X  | X  |    |
| <i>Leptorussa</i> Mosely                 |   |    |   |   |    |    |    |
| (146) <i>darlingtoni</i> (Banks)         | X |    | X |   |    |    | X  |
| <i>Triaenodes</i> McLachlan              |   |    |   |   |    |    |    |
| (147) <i>intricata</i> sp. n.            | X |    | X | X |    | X  |    |
| <i>Oecetis</i> McLachlan                 |   |    |   |   |    |    |    |
| (148) <i>pechana</i> Mosely              | X |    | X |   | X  |    | X  |
| (149) <i>umbra</i> sp. n.                |   |    |   |   | X  |    |    |
| (150) <i>gilva</i> sp. n.                | X |    |   |   |    |    |    |
| (151) <i>australis</i> (Banks)           | X | X  |   | X | X  | X  | X  |
| (152) <i>minasata</i> Mosely             |   |    |   |   |    | X  |    |
| (153) <i>laustra</i> Mosely              | X |    |   |   |    |    |    |
| (154) <i>asmanista</i> Mosely            |   |    | X | X |    | X  |    |
| (155) <i>arcada</i> Mosely               |   |    |   |   | X  | X  |    |
| (156) <i>inscripta</i> Kimmins           | X |    |   | X |    |    | X  |
| (157) <i>scirpicula</i> sp. n.           |   |    |   | X |    |    |    |

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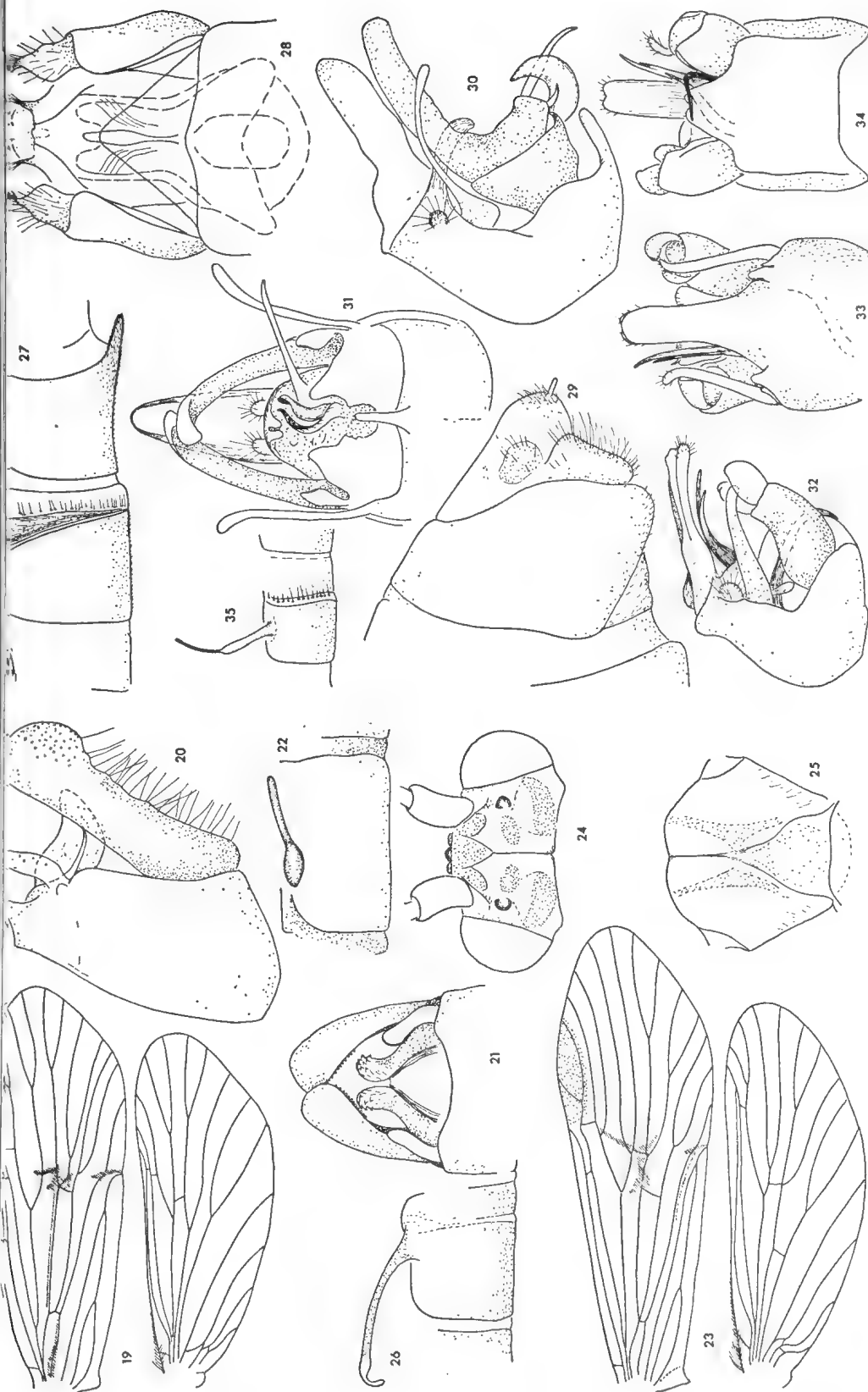




Figures 1-9—*Apsilochorema obliquum* (Mosely)—  
 ♂ Condonion Creek, ♀ Franklin  
 River—1, ♂ wings; 2, ♀ wings; 3, ♂  
 head dorsal; 4, ♂ mesonotum dorsal; 5,  
 ♀ sternite 5 ventral; 6, ♀ sternite 5  
 lateral; 7, ♂ genitalia lateral; 8, ♂ genitalia  
 lateral; 9, ♀ genitalia lateral.

Figures 10-16—*Apsilochorema gishum* (Mosely)—  
 ♂ ♀ 2 km NW Derwent Bridge—10,  
 ♂ wings; 11, ♀ wings; 12, ♀ genitalia  
 lateral; 13, ♀ sternite 5 lateral; 14, ♂  
 genitalia lateral; 15, ♂ genitalia ap-  
 pendage dorsal; 16, ♂ head dorsal.

Figure 17—*Apsilochorema* sp. larva, fore leg.  
 Figure 18—*Taschorema* sp. larva, fore leg.

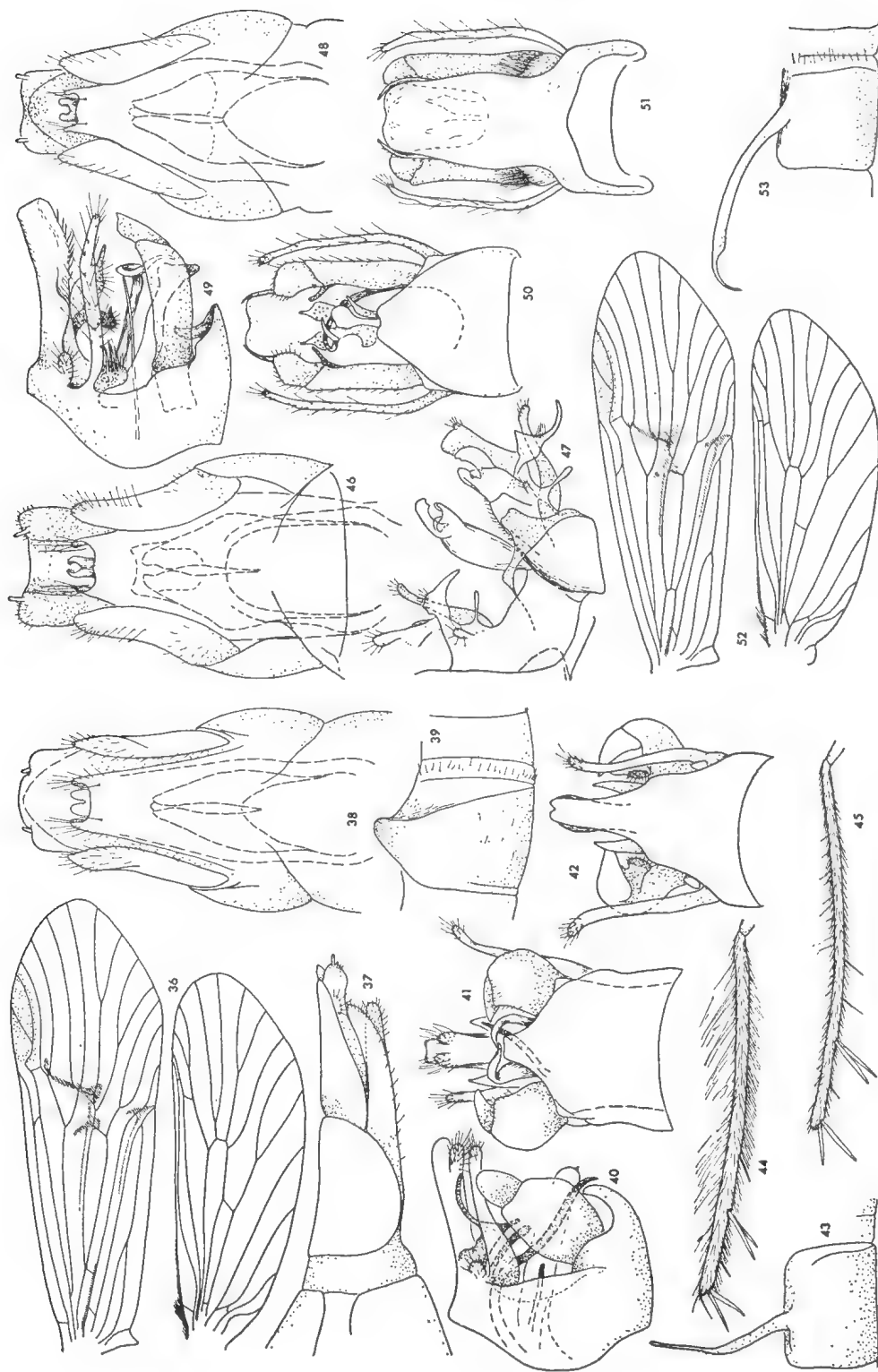


Figures 19-22—*Allochorema tasmanicum* Mosely—♂ Junction Creek—19, ♂ wings; 20, ♂ genitalia lateral; 21, ♂ genitalia dorsal; 22, ♂ lateral filament of sternite 5.

Figures 23-26—*Austrochorema pegidion* Neboiss—♂ Condonion Creek—23, ♂ wings; 24, ♂ head dorsal; 25, ♂ mesonotum dorsal; 26, ♂ lateral filament of sternite 5.

Figures 27-31—*Austrochorema pegidion* Neboiss—♀ Ulverstone—27, ♂ sternites 5 and 6 lateral; 28, ♂ genitalia ventral; 29, ♂ genitalia lateral; 30, ♂ genitalia lateral; 31, ♂ genitalia ventral.

Figures 32-35—*Austrochorema evansi* (Mosely)—♂ Russell Falls—32, ♂ genitalia lateral; 33, ♂ genitalia dorsal; 34, ♂ genitalia ventral; 35, ♂ lateral filament of sternite 5.



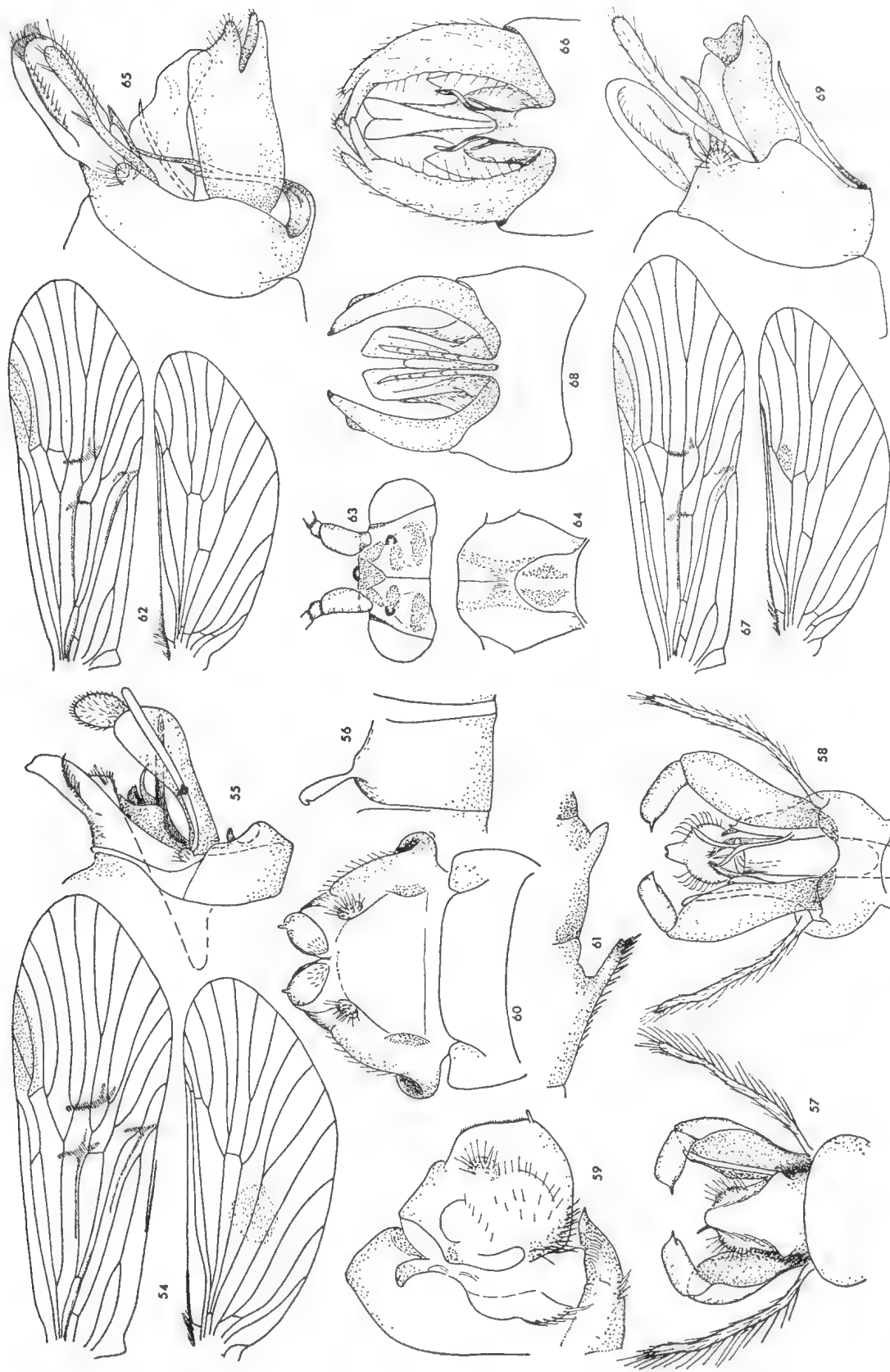
Figures 36-44—*Austrochorema crinitum* sp. n.—♂ ♀ paratypes Guide River Falls: 36, ♂ wings; 37, ♀ genitalia lateral; 38, ♀ genitalia ventral; 39, ♀ sternite 5 lateral; 40, ♂ genitalia lateral; 41, ♂ genitalia ventral; 42, ♂ genitalia dorsal; 43, ♂ lateral filament of sternite 5; 44, ♂ hind tibia.

Figure 45—*Austrochorema complexa* Jacquemart—♂ Lake Pedder, hind tibia.

Figure 46—*Austrochorema evansi* (Mosely)—♀ Russell Falls, genitalia ventral.

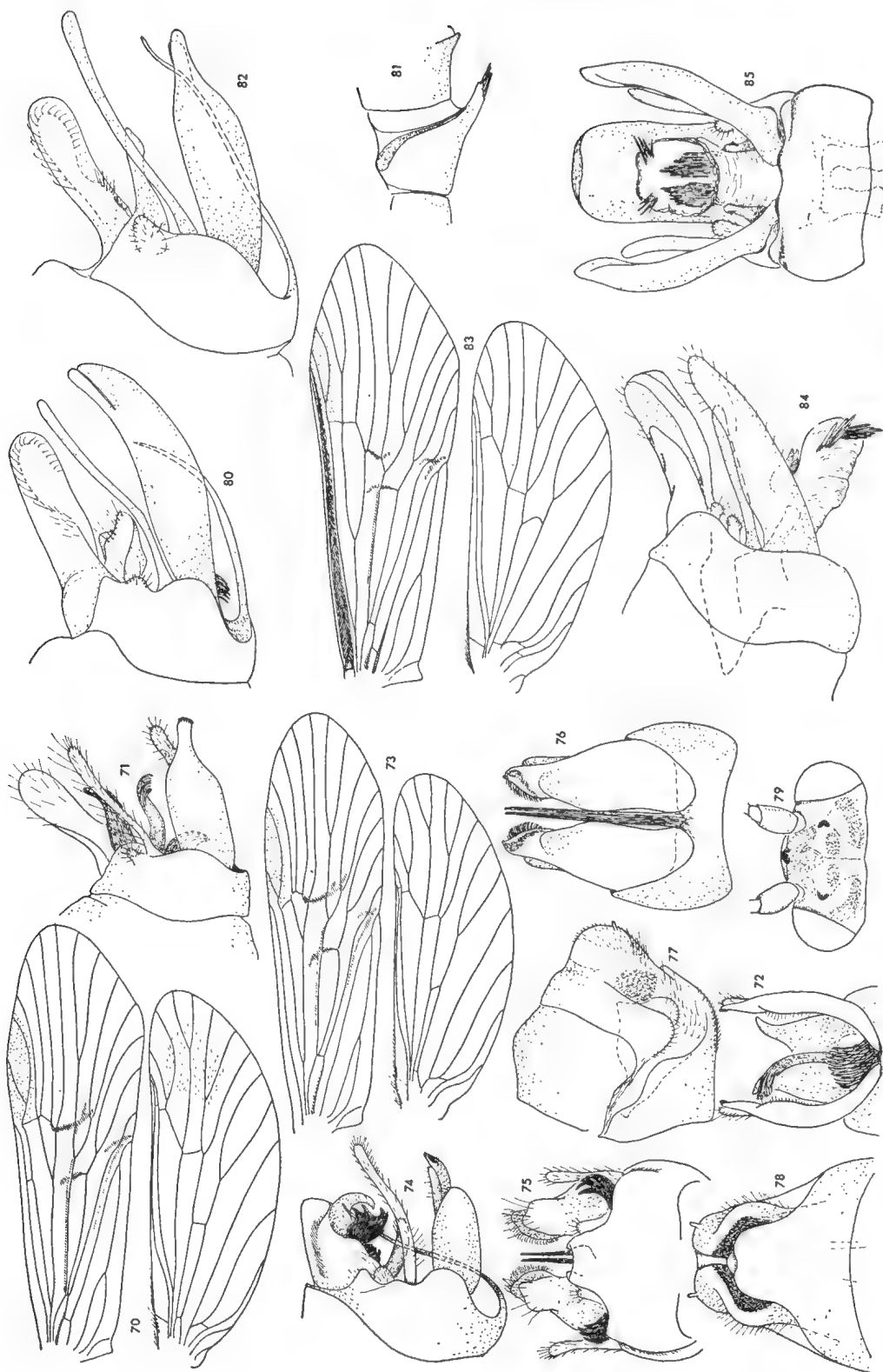
Figures 47-48—*Austrochorema lepnevae* Jacquemart—♂ holotype, Cradle Mtn.—47, ♂ genitalia, drawn from type preparation (IRScNB); 48, ♀ (*lepnevae* ?) Waldheim, Cradle Mtn., genitalia ventral.

Figures 49-53—*Austrochorema complexa* Jacquemart—♂ Lake Pedder: 49, ♂ genitalia lateral; 50, ♂ genitalia ventral; 51, ♂ genitalia dorsal; 52, ♂ wings; 53, ♂ lateral filament of sternite 5.



Figures 54-61—*Ipsebiosis spicula* sp. n.—♂ paratype Lake Pedder, ♀ allotype Lake Dobson—54, ♂ wings (Lake Dobson); 55, ♂ genitalia lateral; 56, ♂ lateral filament of sternite 5; 57, ♂ genitalia dorsal; 58, ♂ genitalia ventral; 59, ♀ genitalia lateral; 60, ♀ genitalia dorsal; 61, ♀ ventral processes of sternites 5 and 6.

Figures 62-66—*Ulmerochorema breve* (Mosely)—♂ Cracroft River—62, ♂ wings; 63, ♂ head dorsal; 64, ♂ mesonotum dorsal; 65, ♂ genitalia lateral; 66, ♂ genitalia ventral. Figures 67-69—*Ulmerochorema seona* (Mosely)—♂ 2 km NW Derwent Bridge, ♀ Targa—67, ♀ wings; 68, ♂ genitalia ventral; 69, ♂ genitalia lateral.



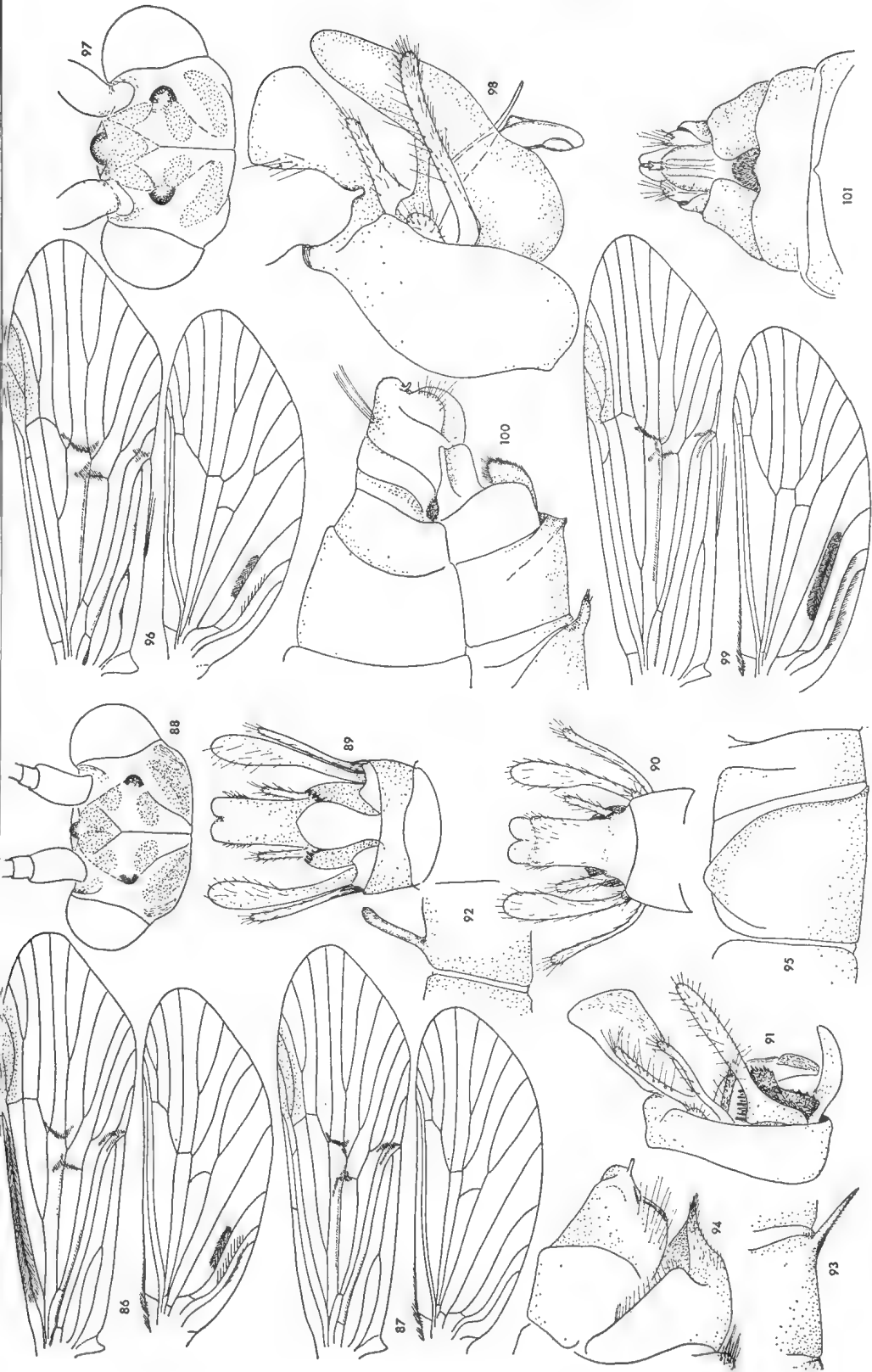
Figures 70-72—*Ulmerochorema lentum* Neboiss—♂ ♀ Evandale—70, ♀ wings; 71, ♂ genitalia lateral; 72, ♂ genitalia ventral.

Figures 73-79—*Ulmerochorema onychion* sp. n.—♂ ♀ paratypes, Evandale—73, ♂ wings; 74, ♂ genitalia lateral; 75, ♂ genitalia dorsal; 76, ♂ genitalia ventral; 77, ♀ genitalia lateral; 78, ♀ genitalia ventral; 79, ♂ head dorsal.

Figures 80-81—*Ulmerochorema tasmanicum* (Mossely)—♂ ♀ Huon-Picton River junction—80, ♂ genitalia lateral; 81, ♀ sternite 5 lateral.

Figure 82—*Ulmerochorema rubiconum* Neboiss—♂ 2 km NW Derwent Bridge—genitalia lateral.

Figures 83-85—*Ethiochorema secutum* sp. n.—♂ paratype, 10 mls E of Strahan—83, ♂ wings; 84, ♂ genitalia lateral; 85, ♂ genitalia ventral.



Figures 86-95—*Ethochorema nesydrion* Neboiss—♂ Waldheim, Cradle Mtn.—86, ♂ wings; 87, ♀ wings; 88, ♂ head dorsal; 89, ♂ genitalia ventral; 90, ♂ genitalia dorsal; 91, ♂ genitalia lateral; 92, ♂ lateral filament of sternite 5; 93, ♂ ventral process of sternite 6; 94, ♀ genitalia lateral; 95, ♀ sternite 5 lateral.

Figures 96-98—*Ethochorema kelion* sp. n.—♂ holotype, ♀ allotype Condominion Creek—96, ♂ wings; 97, ♂ head dorsal; 98, ♂ genitalia lateral.

Figures 99-101—*Taschorema asmanum* Mosely—♂ Lake Dobson, ♀ Wedge River—99, ♂ wings; 100, ♀ genitalia lateral; 101, ♀ genitalia ventral.

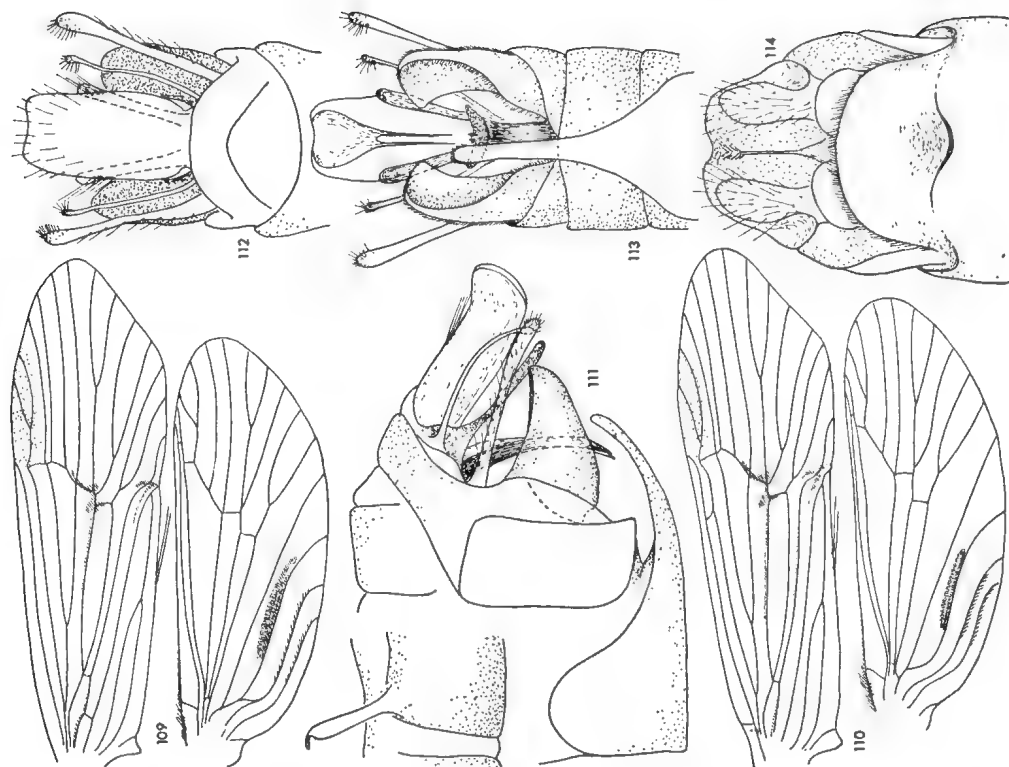


Figure 109—*Taschorema apobamum* sp. n.—♂ paratype Targa, wings.  
 Figures 110-114—*Taschorema ferulum* sp. n.—♀ paratypes Evandale—110, wings; 111, ♂ genitalia lateral; 112, ♂ genitalia dorsal; 113, ♂ genitalia ventral; 114, ♀ genitalia ventral.

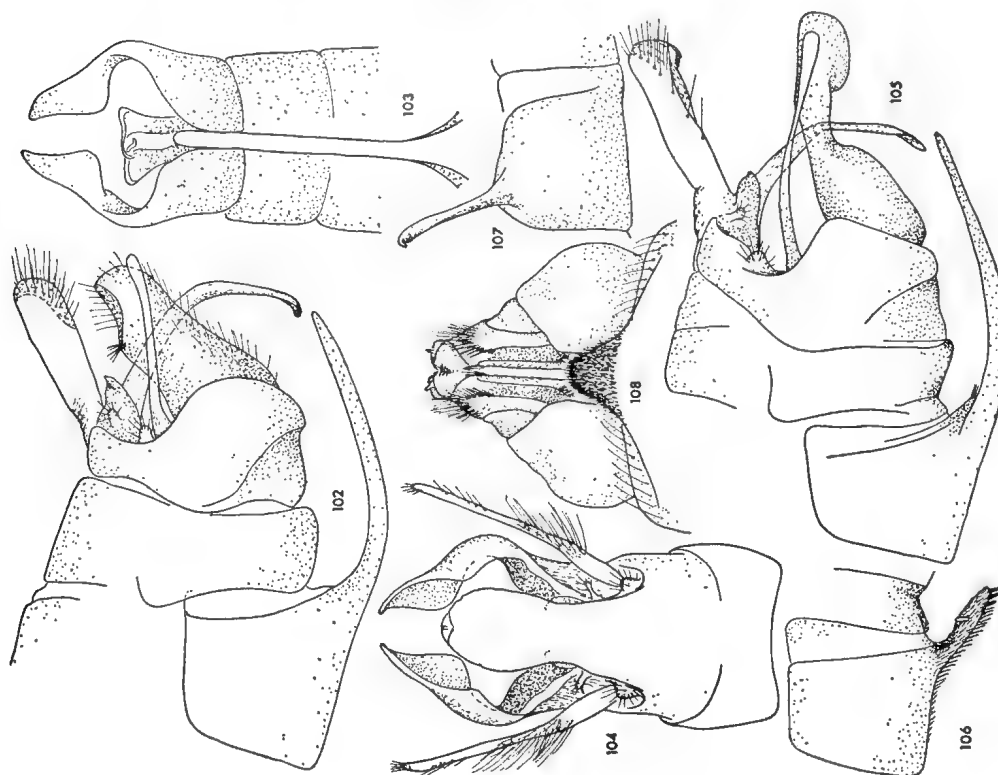
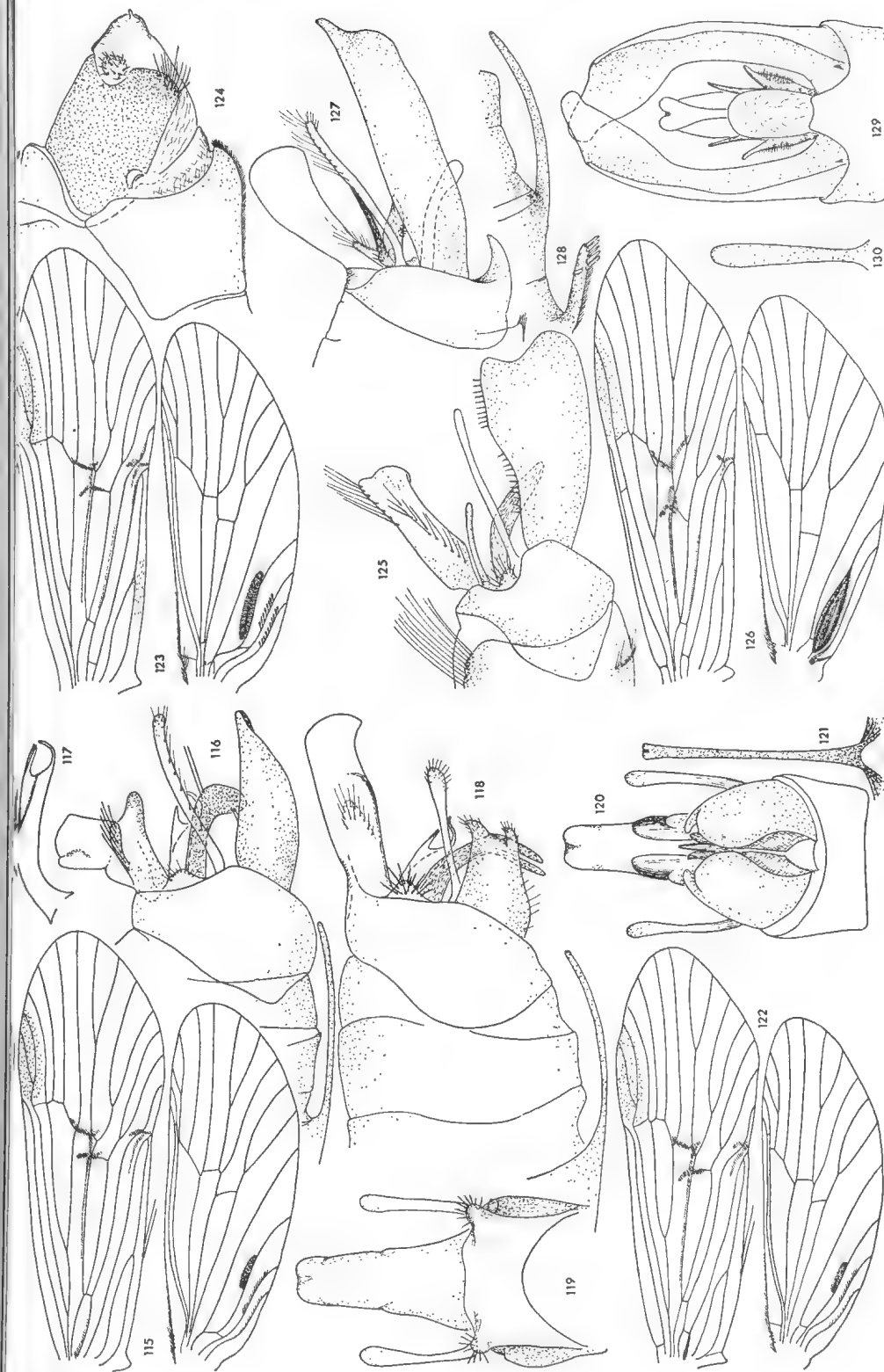


Figure 102—*Taschorema asmanum* Mosely—♂ Lake Dobson, genitalia lateral.  
 Figures 103-108—*Taschorema apobamum* sp. n.—♀ paratypes Targa—103, ♂ genitalia ventral; 104, ♂ genitalia dorsal; 105, ♂ genitalia lateral; 106, ♂ sternite 6 lateral; 107, ♂ lateral filament of sternite 5; 108, ♀ genitalia ventral.



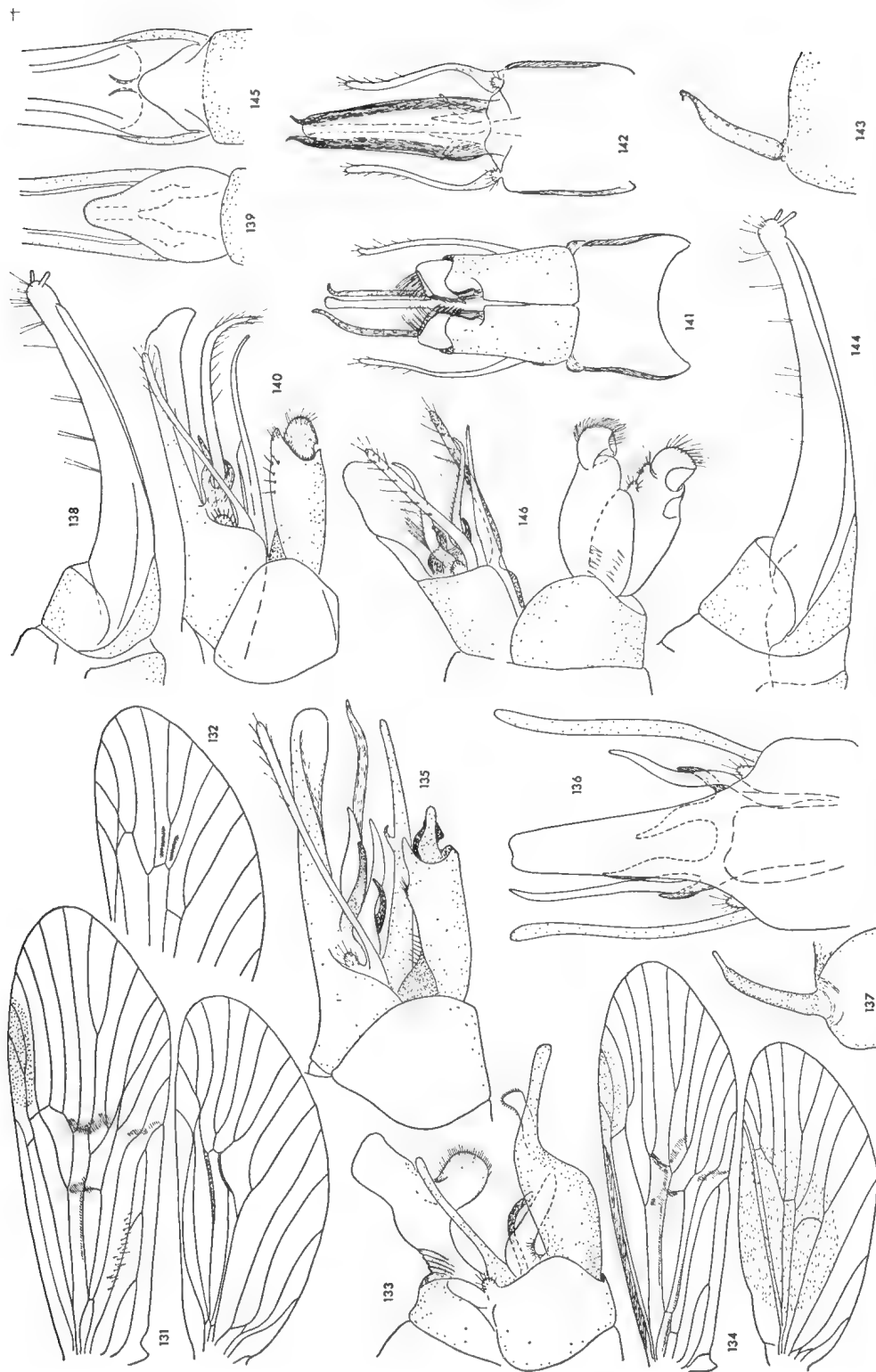


Figures 115-117—*Taschorema viridarium* Neboiss—  
♂ Wedge River—115, ♂ wings; 116, ♂ genitalia lateral; 117, phallus lateral.

Figures 118-122—*Taschorema pedunculatum* Jacquemart—♂ Condominion Creek—118, ♂ genitalia lateral; 119, ♂ genitalia dorsal; 120, ♂ genitalia ventral; 121, ♂ ventral view of ventral process of sternite 7; 122, ♂ wings.

Figures 123-125—*Taschorema evansi* Mosely—♂ ♀ Targa—123, ♂ wings; 124, ♂ genitalia lateral; 125, ♂ genitalia lateral.

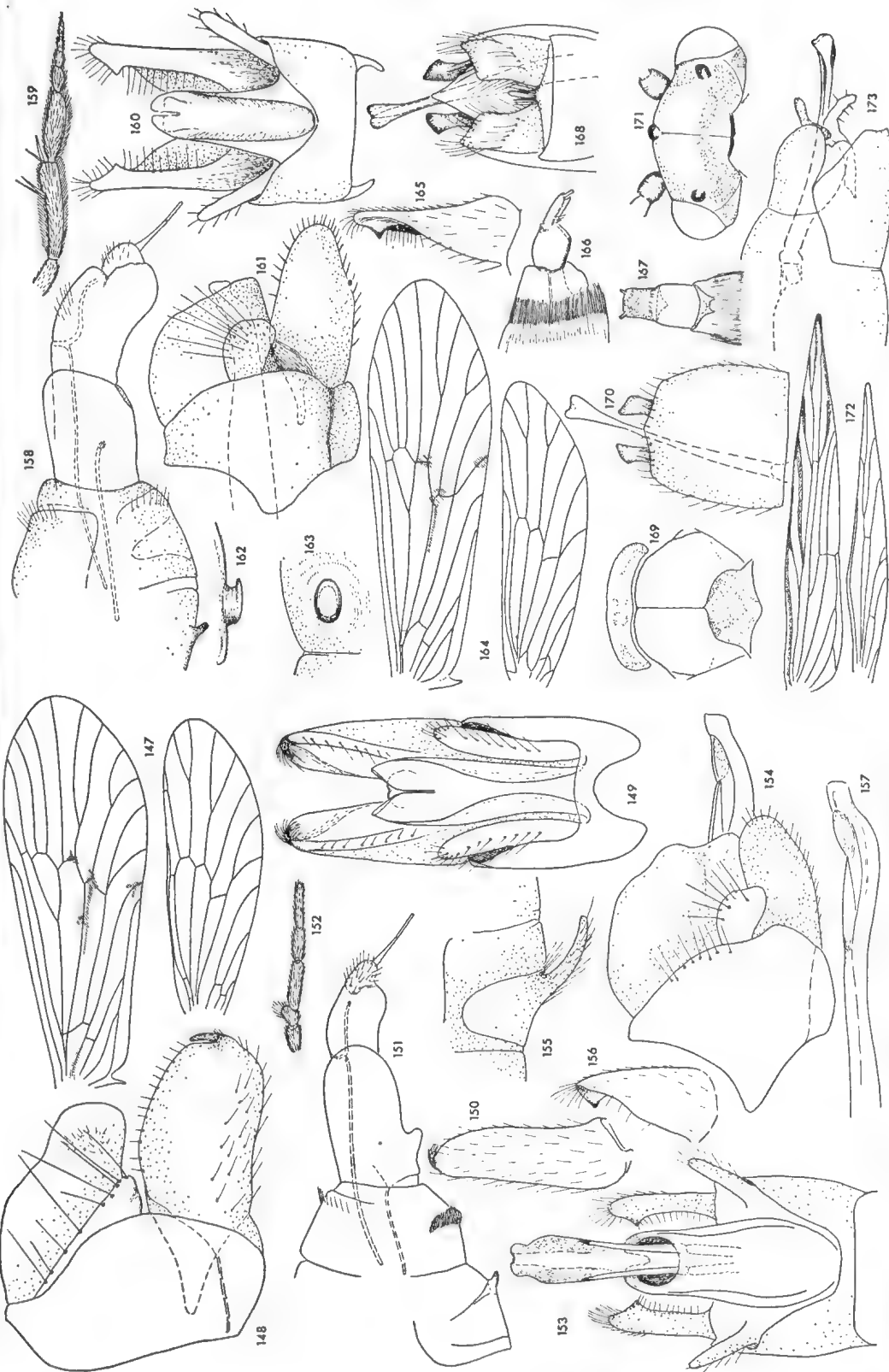
Figures 126-130—*Ptychobiosis nigrita* (Banks)—♂ Waldheim, Cradle Mtn.—126, ♂ wings; 127, ♂ genitalia lateral; 128, ♂ ventral process of sternites 6 and 7, lateral view; 129, ♂ genitalia ventral; 130, ♂ ventral view of ventral process of sternite 7.



Figures 131-133—*Koetonga clivicola* Neboiss—♂ Huon River Crossing, ♀ West-Arthur Plains—131, ♂ wings; 132, ♀ posterior wing, distal half; 133, ♂ genitalia lateral. Figures 134-137—*Moruya charadra* Neboiss—♂ Waldheim, Cradle Mtn.—134, ♂ wings; 135, ♂ genitalia lateral; 136, ♂ genitalia dorsal; 137, ♂ lateral filament of sternite 5.

Figures 138-139—*Moruya charadra* Neboiss—♀ Lake Dobson—138, ♀ genitalia lateral; 139, ♀ genitalia ventral. Figures 140-145—*Moruya opora* Neboiss—♂ Miena, ♀ 2 km NW Derwent Bridge—140, ♂ genitalia lateral; 141, ♂ genitalia ventral; 142, ♂ genitalia dorsal; 143, ♂ lateral filament of sternite 5; 144, ♀ genitalia lateral; 145, ♀ genitalia ventral.

Figure 146—*Moruya tasmanica* (Jacquemart)—♂ holotype Cradle Mtn.—genitalia lateral, drawn from type preparation (IRS&NB).



Figures 147-152—*Agapetus tasmanicus* (Mosely)—♂ ♀ Buxton River—147, ♂ wings; 148, ♂ genitalia lateral; 149, ♂ genitalia dorsal; 150, inferior appendage ventral; 151, ♀ genitalia lateral; 152, ♀ maxillary palp.

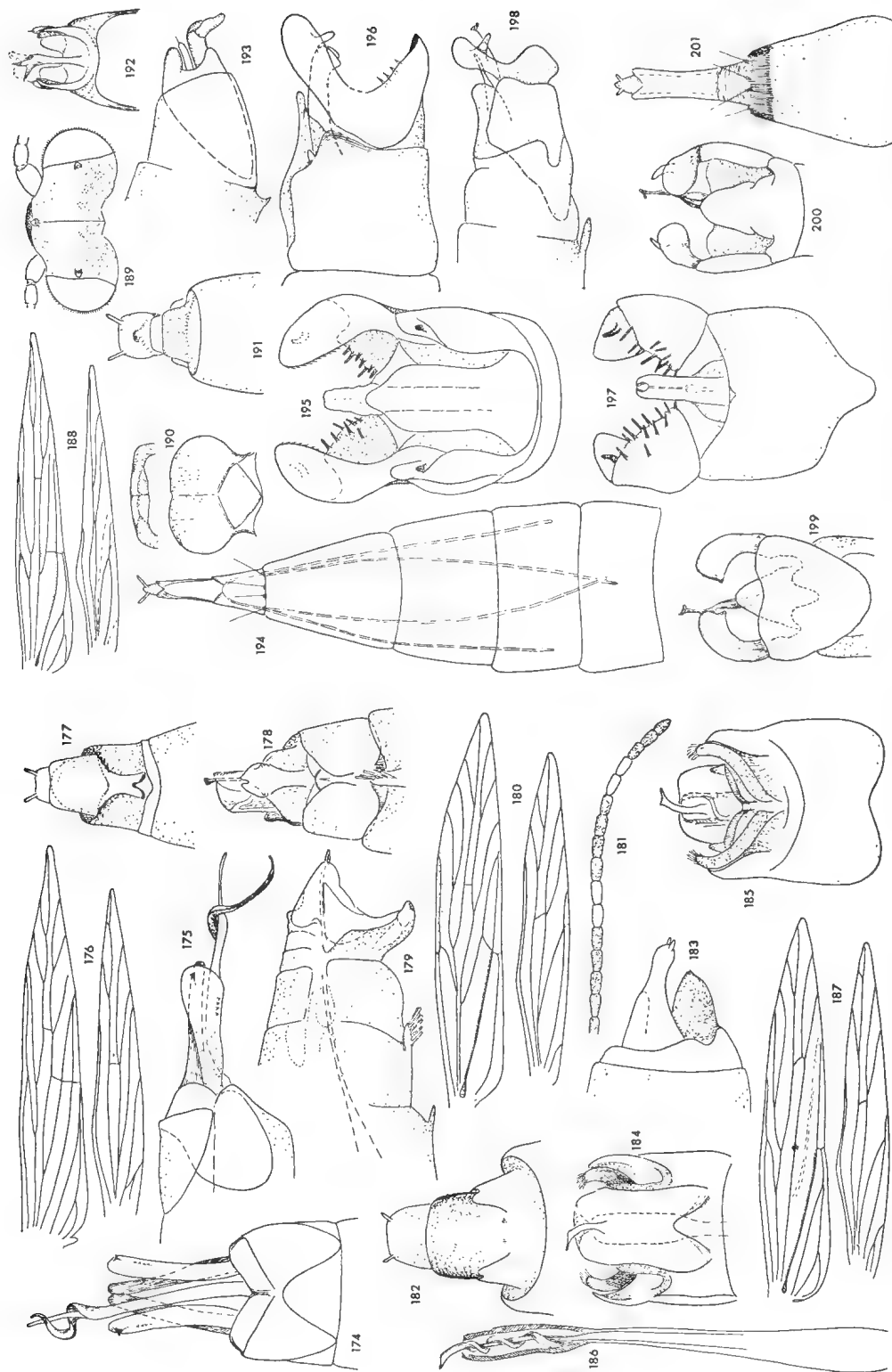
Figures 153-157—*Agapetus cralus* (Mosely)—♂ ♀ Russell Falls—153, ♂ genitalia dorsal; 154, ♂ genitalia lateral; 155, ♂ sternite 6 lateral; 156, inferior appendage ventral; 157, phallus lateral.

Figures 158-159—*Agapetus cralus* (Mosely)—♀ Russell Falls—158,

♀ genitalia lateral; 159, ♀ median leg.

Figures 160-165—*Agapetus laparus* sp. n.—♂ Condominion Creek—160, ♂ genitalia dorsal; 161, ♂ genitalia lateral; 162, ♂ dorsal view of lateral plate of sternite 5; 163, ♂ lateral view of lateral plate of sternite 5; 164, ♂ wings; 165, inferior appendage ventral.

Figures 166-173—*Orphnitrictia acta* sp. n.—♂ ♀ Ulverstone—166, ♀ genitalia lateral; 167, ♀ genitalia ventral; 168, ♂ genitalia dorsal; 169, ♂ pronotum and mesonotum dorsal; 170 ♂ genitalia ventral; 171 ♂ head dorsal; 172, ♂ wings; 173, ♂ genitalia lateral.



Figures 188-193—*Trichogene columba* sp. n.—♂ paratypes Cradle Mtn.—188, ♂ wings; 189, ♂ head dorsal; 190, ♂ pronotum and mesonotum dorsal; 191, ♀ genitalia ventral; 192, ♂ genitalia dorsal; 193, ♂ genitalia lateral.

Figures 194-197—*Maydenopitila cuneola* sp. n.—♀ paratypes Wedge River—194, ♀ abdomen ventral; 195, ♂ genitalia dorsal; 196, ♂ genitalia lateral; 197, ♂ genitalia ventral.

Figures 198-201—*Maydenopitila ripina* sp. n.—♂ paratype Scamander, ♀ paratype Guide River Falls—198, ♂ genitalia lateral; 199, ♂ genitalia ventral; 200, ♂ genitalia dorsal; 201, ♀ genitalia ventral.

Figures 174-176—*Hydropitila scamandra* sp. n.—♂ paratype Scamander—174, ♂ genitalia ventral; 175, ♂ genitalia lateral; 176, ♂ wings.

Figures 177-181—*Targuirichia zonata* sp. n.—♂ paratypes Targa—177, ♀ genitalia ventral; 178, ♂ genitalia ventral; 179, ♂ genitalia lateral; 180, ♂ wings; 181, distal end of ♂ antenna.

Figures 182-187—*Hellyethira valleculea* sp. n.—♂ paratypes Hellyer River Gorge—182, ♀ genitalia ventral; 183, ♀ genitalia lateral; 184, ♂ genitalia dorsal; 185, ♂ genitalia ventral; 186, phallus dorsal; 187, ♂ wings.

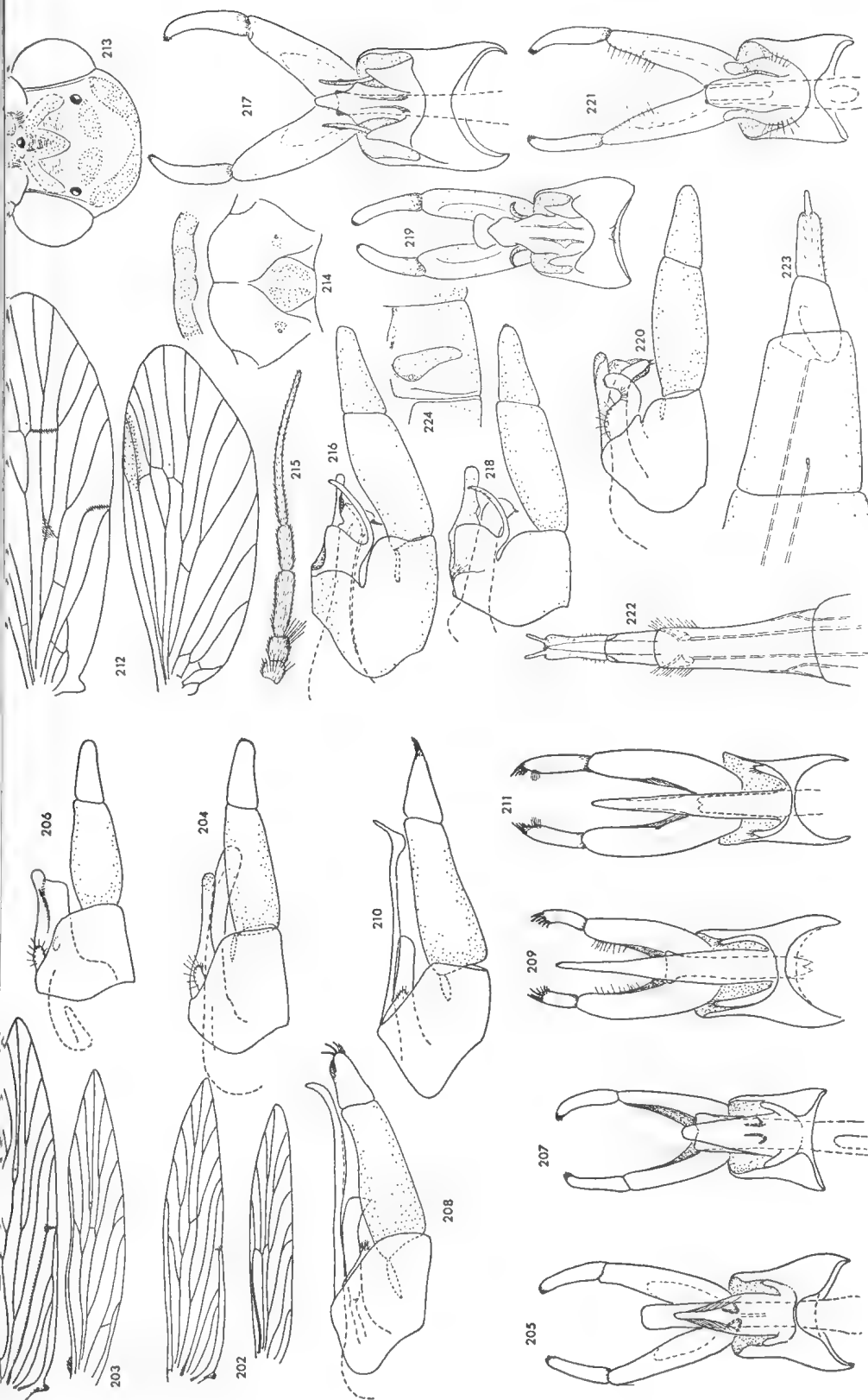


Figure 202—*Maydenoptila rupina* sp. n.—♂ paratype Scamander, wings.

Figure 203—*Maydenoptila cuneola* sp. n.—♂ paratype Wedge R., wings.

Figures 204-205—*Hydrobiosella corinna* sp. n.—♂ paratype Corinna—204, ♂ genitalia lateral; 205, ♂ genitalia dorsal.

Figures 206-207—*Hydrobiosella orba* sp. n.—♂ holotype Wedge R.—206, ♂ genitalia lateral; 207, ♂ genitalia dorsal.

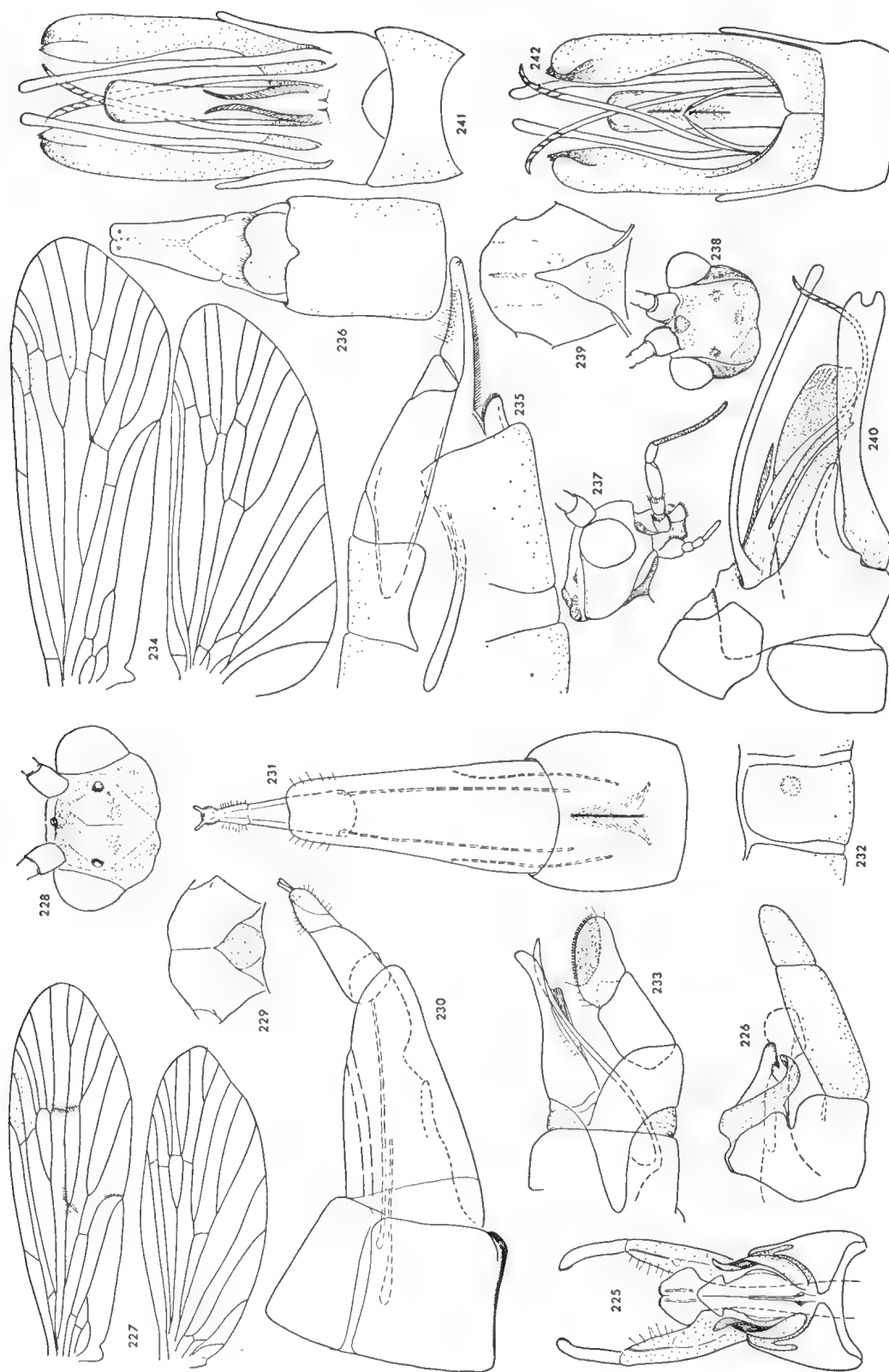
Figures 208-209—*Hydrobiosella cerula* sp. n.—♂ holotype Lake Pedder—208, ♂ genitalia lateral; 209, ♂ genitalia dorsal.

Figures 210-211—*Hydrobiosella anasina* sp. n.—♂ paratype Duck R.

Figures 212-217—*Hydrobiosella tasmanica* Mosely—♂ Hastings Caves—212, ♂ wings; 213, ♂ head dorsal; 214, ♂ pronotum and mesonotum dorsal; 215, ♂ maxillary palp; 216, ♂ genitalia lateral; 217, ♂ genitalia dorsal.

Figures 218-219—*Hydrobiosella armata* Jacquemart—♂ Hobart—218, ♂ genitalia lateral; 219, ♂ genitalia dorsal.

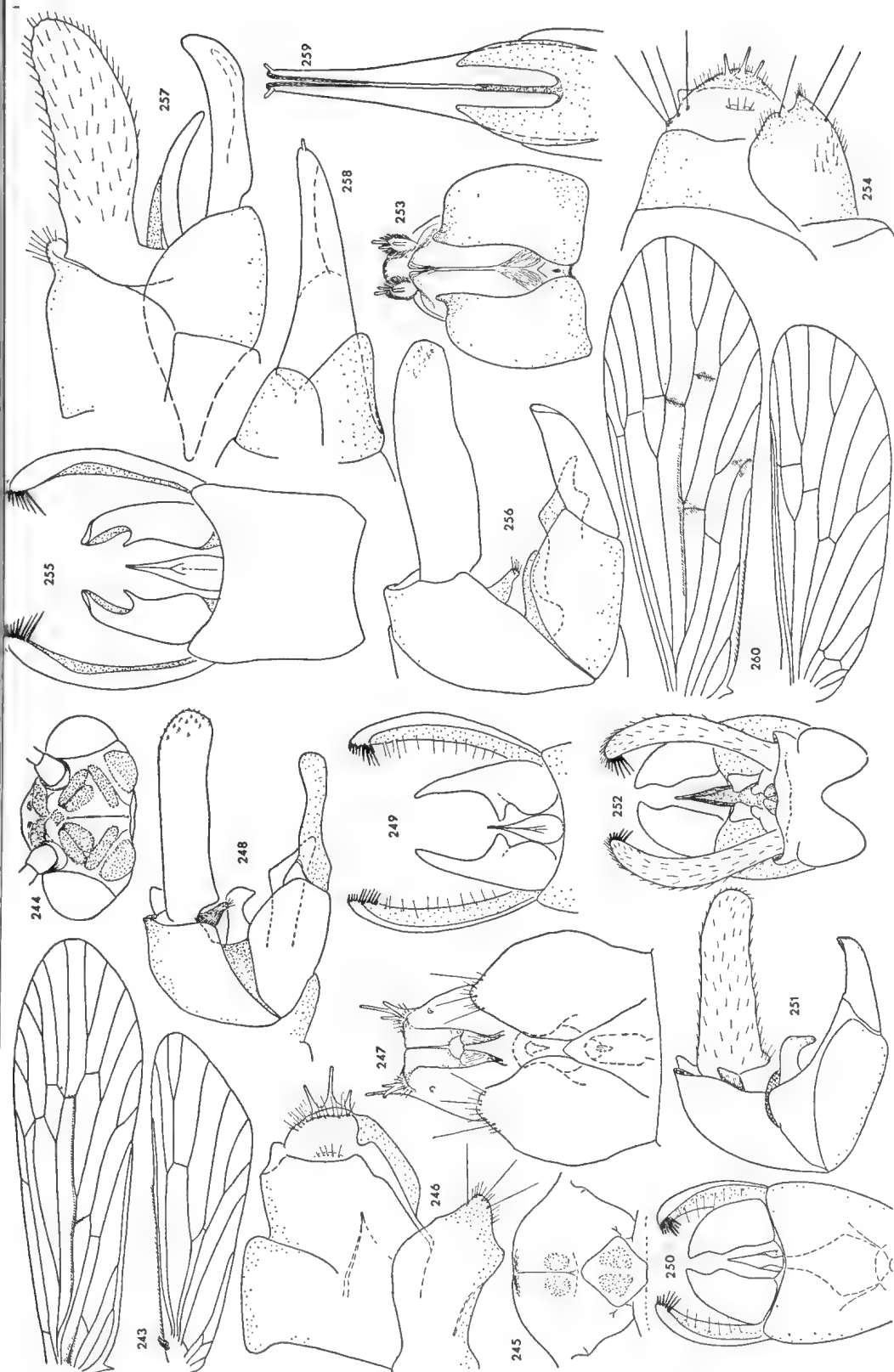
Figures 220-224—*Hydrobiosella cognata* Kimmins—♂ Liena—220, ♂ genitalia lateral; 221, ♂ genitalia dorsal; 222, ♀ genitalia dorsal; 223, ♀ genitalia lateral; 224, ♀ valvular structure of sternite 5.



Figures 225-226—*Hydrobiosella sagitta* sp. n.—♂ paratype St. Columbia Falls—225, ♂ genitalia dorsal; 226, ♂ genitalia lateral.

Figures 227-233—*Hydrobiosella waddama* Mosely—♂ ♀ Lake Dobson—227, ♂ wings; 228, ♂ head dorsal; 229, ♂ mesonotum dorsal; 230, ♀ genitalia lateral; 231, ♀ genitalia ventral; 232, ♀ sternite 4 lateral; 233, ♂ genitalia lateral.

Figures 234-242—*Stenopsychodes lineata* sp. n.—♂ ♀ paratypes Bluff Hill Creek—234, ♂ wings; 235, ♀ genitalia lateral; 236, ♀ genitalia ventral; 237, ♂ head lateral; 238, ♂ head dorsal; 239, ♂ mesonotum dorsal; 240, ♂ genitalia lateral; 241, ♂ genitalia dorsal; 242, ♂ genitalia ventral.



Figures 243-249—*Ecnomus tillyardi* Mosely—♂ ♀ Leven River nr. Heka—243, ♂ wings; 244, ♀ head dorsal; 245, ♀ mesonotum dorsal; 246, ♀ genitalia lateral; 247, ♀ genitalia ventral; 248, ♂ genitalia lateral; 249, ♂ genitalia ventral.

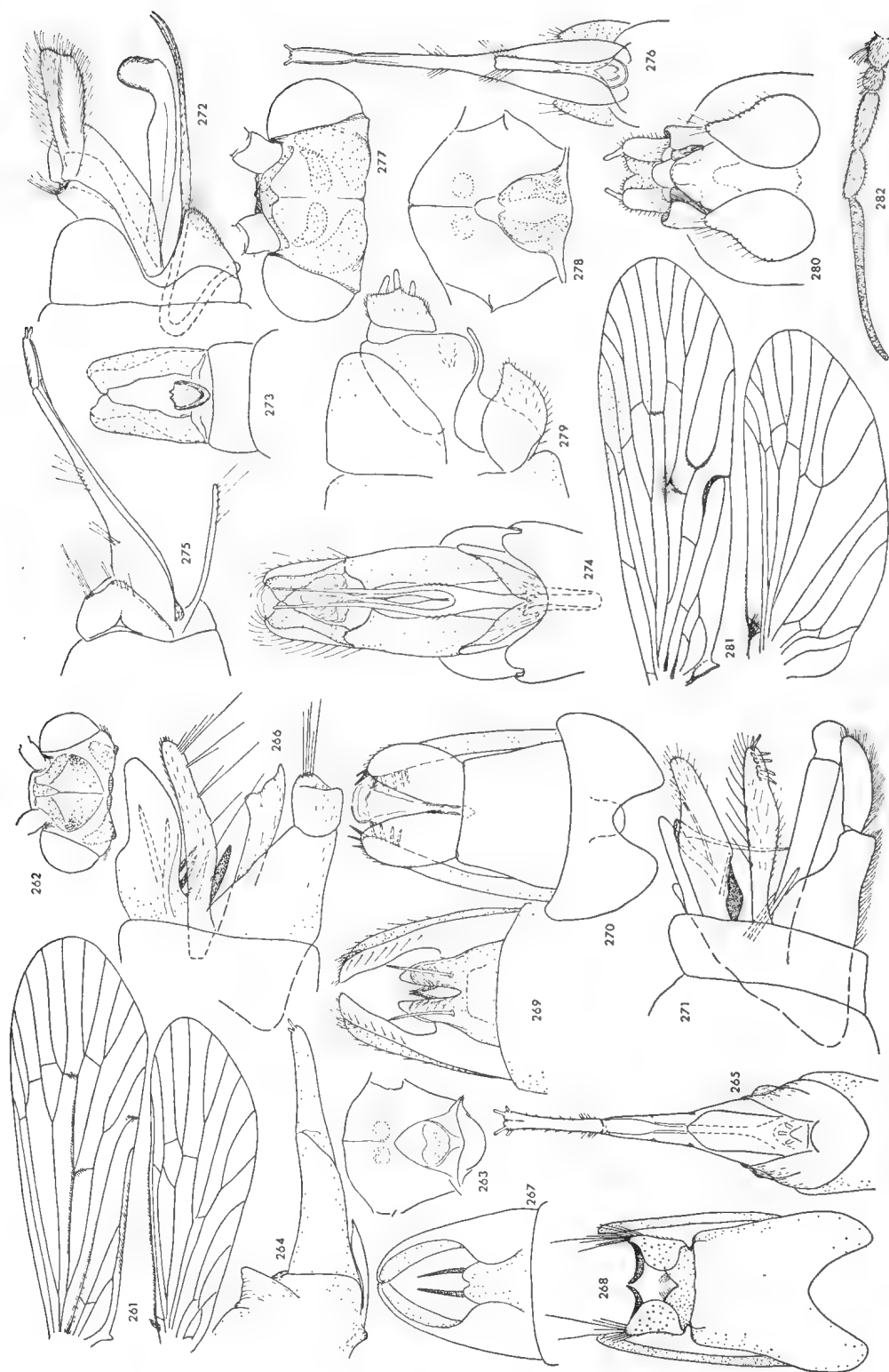
Figures 250-252—*Ecnomus russellii* sp. n.—♂ paratype Russell Falls—250, ♂ genitalia ventral; 251, ♂ genitalia lateral; 252, ♂ genitalia dorsal.

Figures 253-254—*Ecnomus russellii* sp. n.—♀ paratype Russell Falls—253, ♀ genitalia ventral; 254, ♀ genitalia lateral.

Figures 255-256—*Ecnomus continentalis* Ulmer—♂ Evandale—255, ♂ genitalia ventral; 256, ♂ genitalia lateral.

Figures 257-260—*Ecnomina irrorata* Kimmins—♀ Huon-Picton River junction—257, ♂ genitalia lateral; 258, ♀ genitalia lateral; 259, ♀ genitalia ventral; 260, ♂ wings.



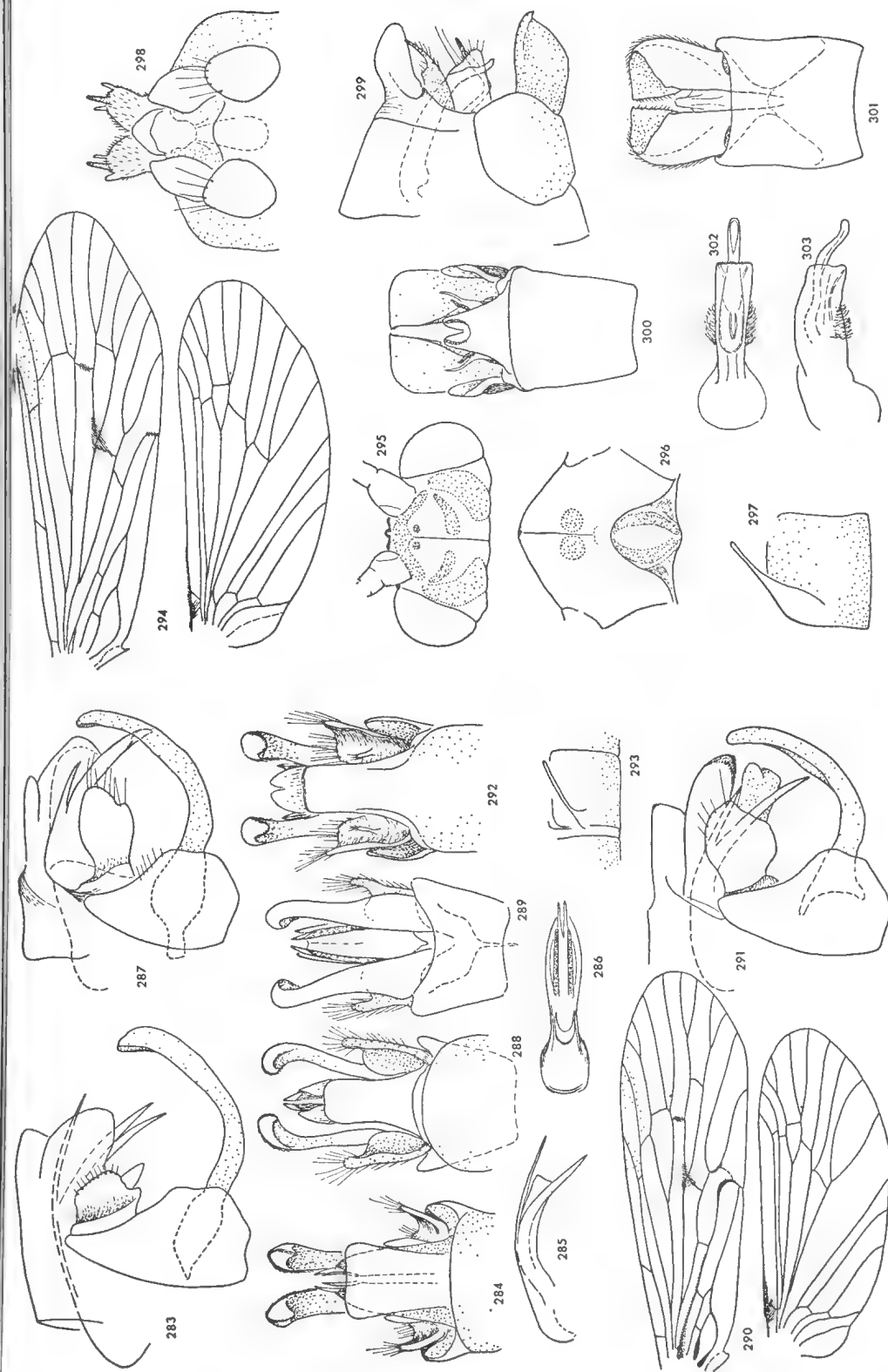


Figures 261-268—*Ecnomina legula* sp. n.—♂ ♀ paratypes West Arthur Plains—261, ♂ wings; 262, ♂ head dorsal; 263, ♂ mesonotum dorsal; 264, ♀ genitalia lateral; 265, ♀ genitalia ventral; 266, ♂ genitalia lateral; 267, ♂ genitalia dorsal; 268, ♂ genitalia ventral.

Figures 269-271—*Ecnomina vega* sp. n.—♂ holotype Macquarie River 8 km W of Campbell Town—269, ♂ genitalia dorsal; 270, ♂ genitalia ventral; 271, ♂ genitalia lateral.

Figures 272-276—*Ecnomina batyle* sp. n.—♂ ♀ paratypes Wilnot River, 10 km S of Forth—272, ♂ genitalia lateral; 273, ♂ genitalia dorsal; 274, ♂ genitalia ventral; 275, ♀ genitalia lateral; 276, ♀ genitalia ventral.

Figures 277-282—*Plectrocnemia altera* sp. n.—♂ ♀ paratypes Waldheim, Cradle Mtn.—277, ♂ head dorsal; 278, ♂ mesonotum dorsal; 279, ♀ genitalia lateral; 280, ♀ genitalia ventral; 281, ♂ wings; 282, ♂ maxillary palp.



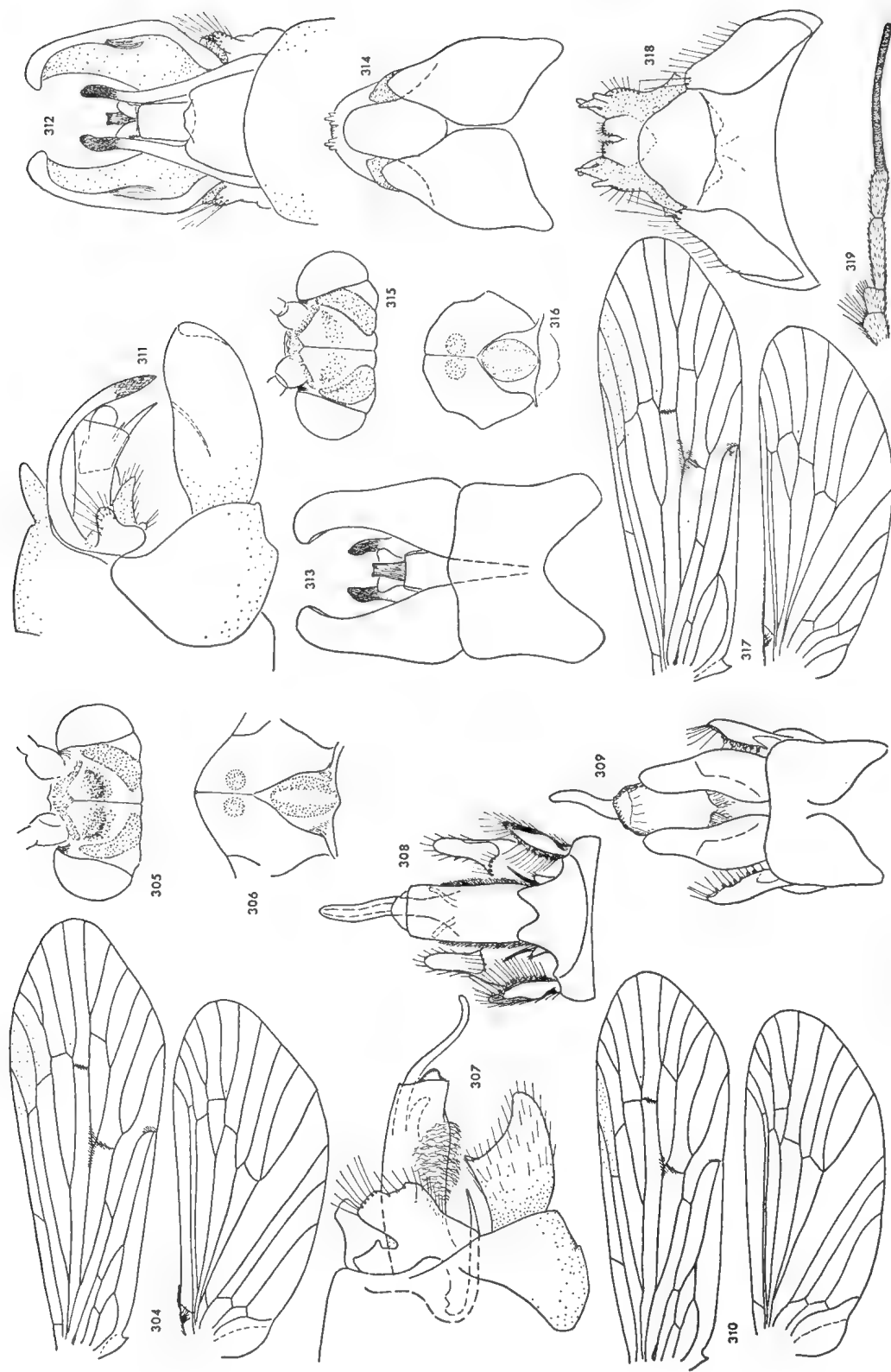
Figures 283-286—*Plectrocnemia altera* sp. n.—♂ paratype, Waldheim, Cradle Mtn.—283, ♂ genitalia lateral; 284, ♂ genitalia dorsal; 285, phallus lateral; 286, phallus dorsal.

Figures 287-289—*Plectrocnemia australica* Banks—♂ holotype Mt. Kosciuszko (ANIC)—287, ♂ genitalia lateral; 288, ♂ genitalia dorsal; 289, ♂ genitalia ventral.

Figures 290-293—*Plectrocnemia lacuna* sp. n.—♂ paratype Lake Leake—290, ♂ wings; 291, ♂ genitalia lateral; 292,

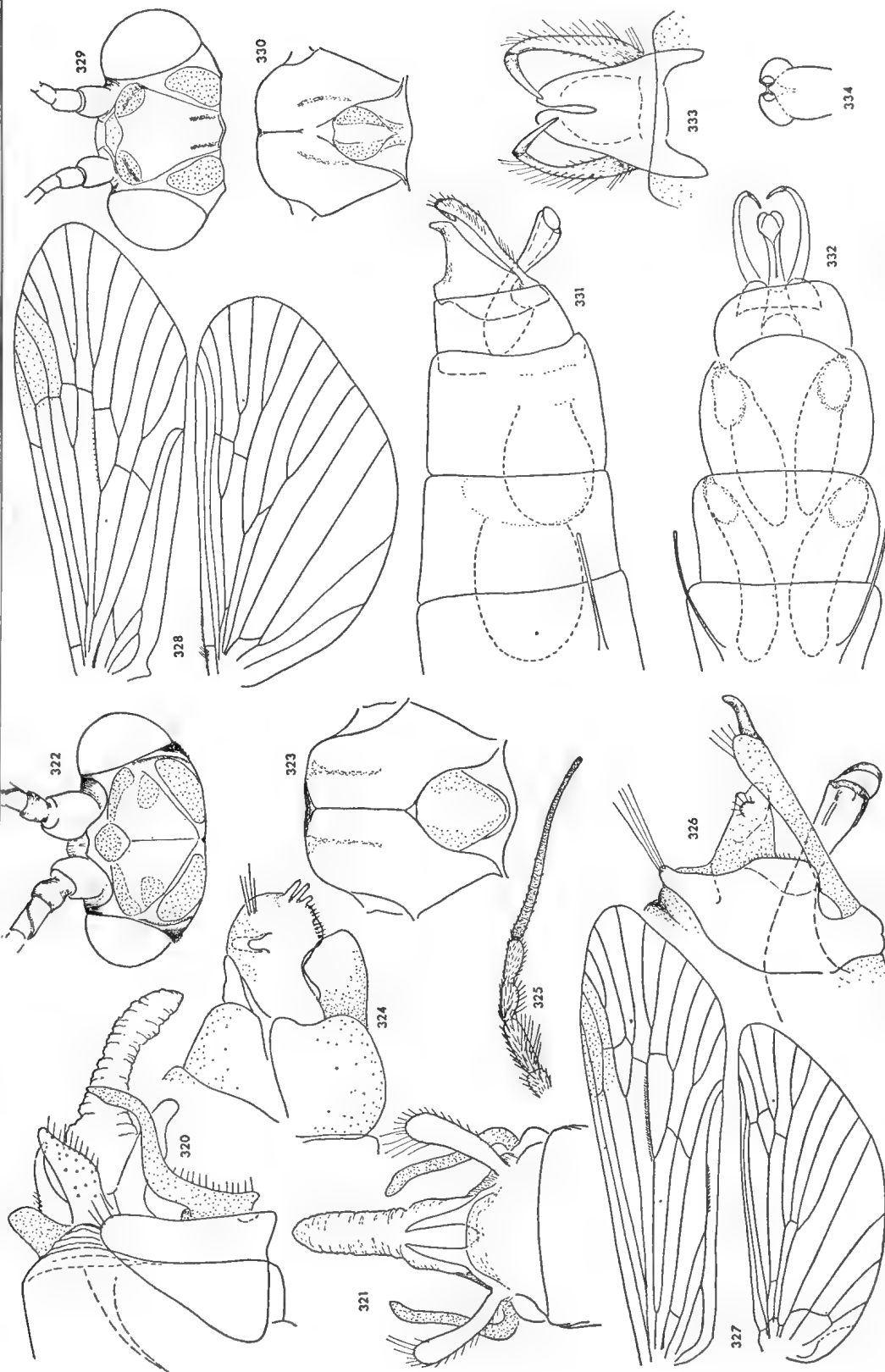
♂ genitalia dorsal; 293, ♂ lateral filament of sternite 5.

Figures 294-303—*Plectrocnemia manicata* sp. n.—♂ paratypes Hellyer River Gorge—294, ♂ wings; 295, ♂ head dorsal; 296, ♂ mesonotum dorsal; 297, ♂ lateral filament of sternite 5; 298, ♀ genitalia ventral; 299, ♂ genitalia lateral; 300, ♂ genitalia dorsal; 301, ♂ genitalia ventral; 302, phallus dorsal; 303, phallus lateral.



Figures 304-309—*Plectrocnemia caudata* sp. n.—♂ paratype, West Arthur Plains—304, ♂ wings; 305, ♂ head dorsal; 306, ♂ mesonotum dorsal; 307, ♂ genitalia lateral; 308, ♂ genitalia dorsal; 309, ♂ genitalia ventral.  
 Figure 310—*Tasmanoplegas spilota* sp. n.—♂ holotype, West Arthur Plains, wings.  
 Figures 311-314—*Tasmanoplegas spilota* sp. n.—♂ holotype, ♀ allotype, West Arthur

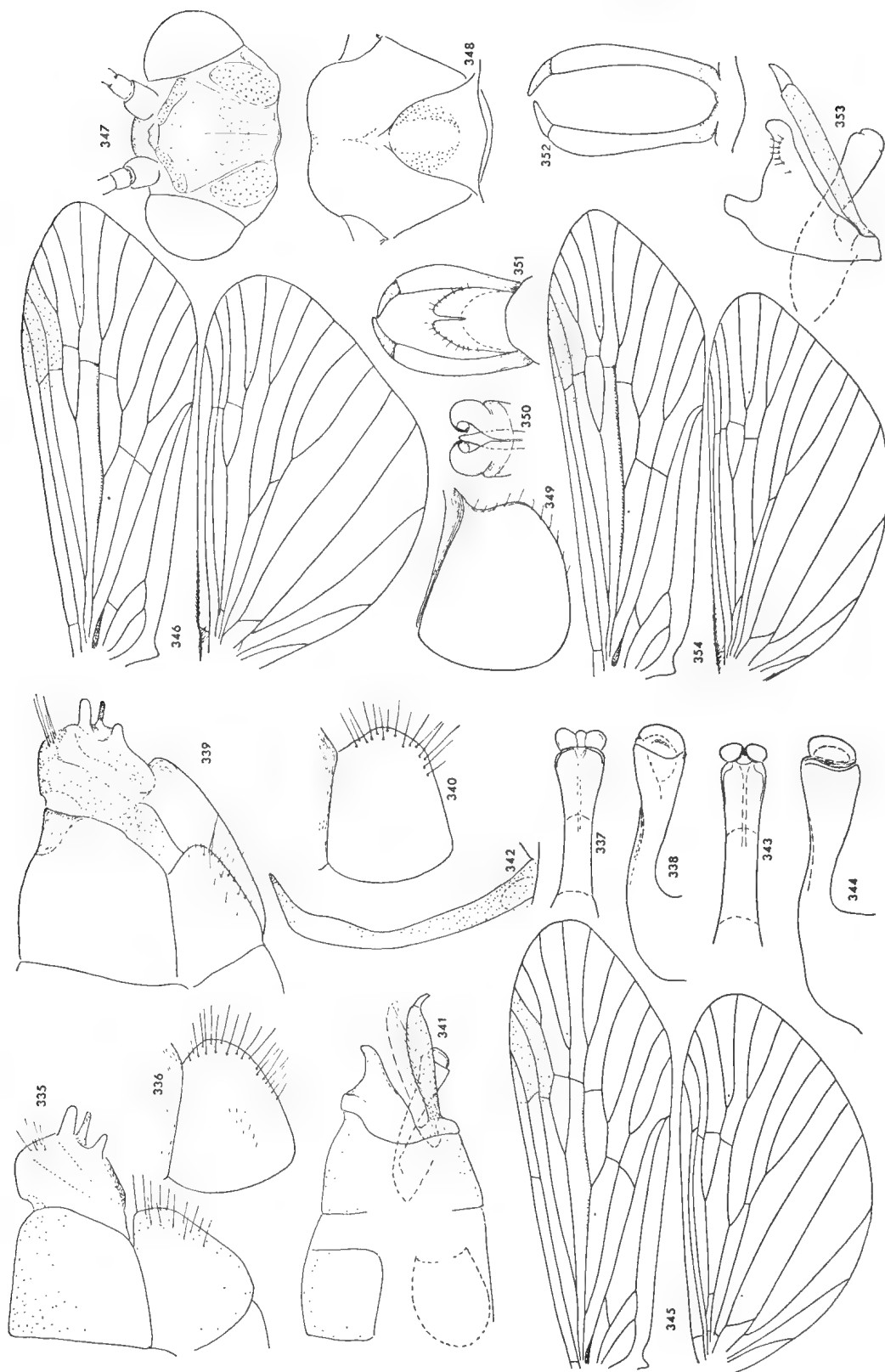
Plains—311, ♂ genitalia lateral; 312, ♂ genitalia dorsal; 313, ♂ genitalia ventral; 314, ♀ genitalia ventral.  
 Figures 315-319—*Nyctiophylax repandus* sp. n.—♂ paratype, ♀ allotype, Scamander River—315, ♂ head dorsal; 316, ♂ mesonotum dorsal; 317, ♂ wings; 318, ♀ genitalia ventral; 319, ♂ maxillary palp.



Figures 320-321—*Nyctiophylax repandus* sp. n.—  
 ♂ paratype Scamander River—320, ♂ genitalia lateral; 321, ♂ genitalia dorsal.

Figures 322-327—*Cheumatopsyche modica* McLachlan—♂ Macquarie River 8 km W of Campbell Town, ♀ 2 km NW Derwent Bridge—322, ♂ head dorsal; 323, ♂ mesonotum dorsal; 324, ♀ genitalia lateral; 325, ♂ maxillary palp; 326, ♂ genitalia

Figures 328-334—*Smicrophylax creektona* sp. n.—♂ paratypes Dover—328, ♂ wings; 329, ♂ head dorsal 330, ♂ mesonotum dorsal; 331, ♂ part of abdomen lateral, showing position of the internal membranous organs; 332, ♂ part of abdomen ventral; 333, ♂ genitalia dorsal; 334, apex of phallus ventral.

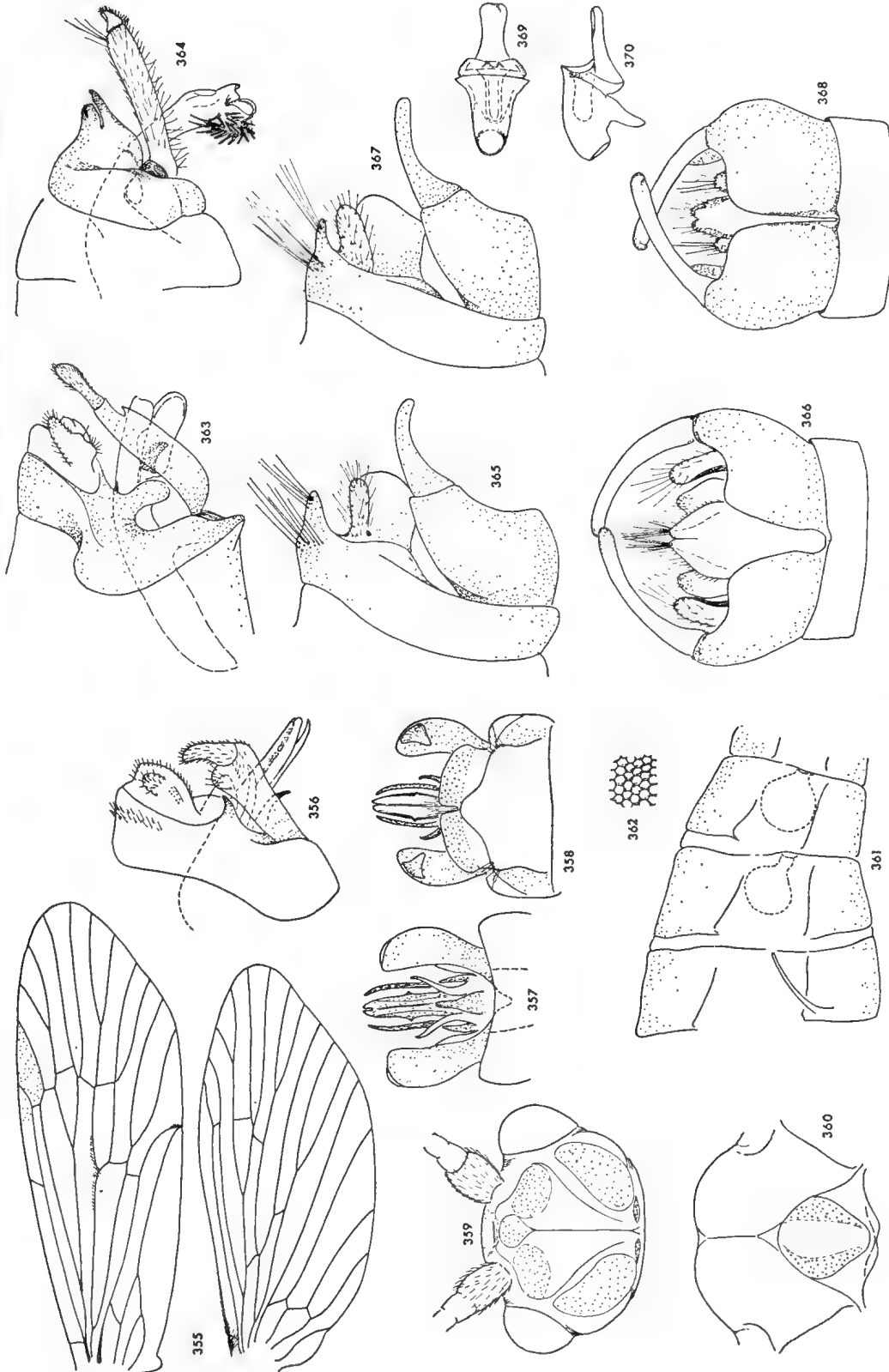


Figures 335-338—*Smicrophylax creektona* sp. n.—♂ ♀ paratypes  
Dover—335, ♀ genitalia lateral; 336, ♀ sternite 8;  
337, phallus dorsal; 338, phallus lateral.

Figures 339-345—*Smicrophylax simplex* (Jacquemart)—♂ ♀ Dove  
River, Cradle Mtn.—339, ♀ genitalia lateral; 340,  
♀ sternite 8; 341, ♂ genitalia lateral, drawn from  
type preparation; 342, inferior appendage ventral;  
343, phallus dorsal; 344, phallus lateral; 345,  
♂ wings.

Figures 346-353—*Asmicridea edwardsi* (McLachlan)—♂ ♀ Leven  
River, Heka—346, ♂ wings; 347, ♂ head dorsal;  
348, ♂ mesonotum dorsal; 349, ♀ sternite 8; 350,  
apex of phallus; 351, ♂ genitalia dorsal; 352, in-  
ferior appendage ventral; 353, ♂ genitalia lateral.

Figure 354—*Asmicridea grisea* (Mosely)—♂ Western Lakes—wings.



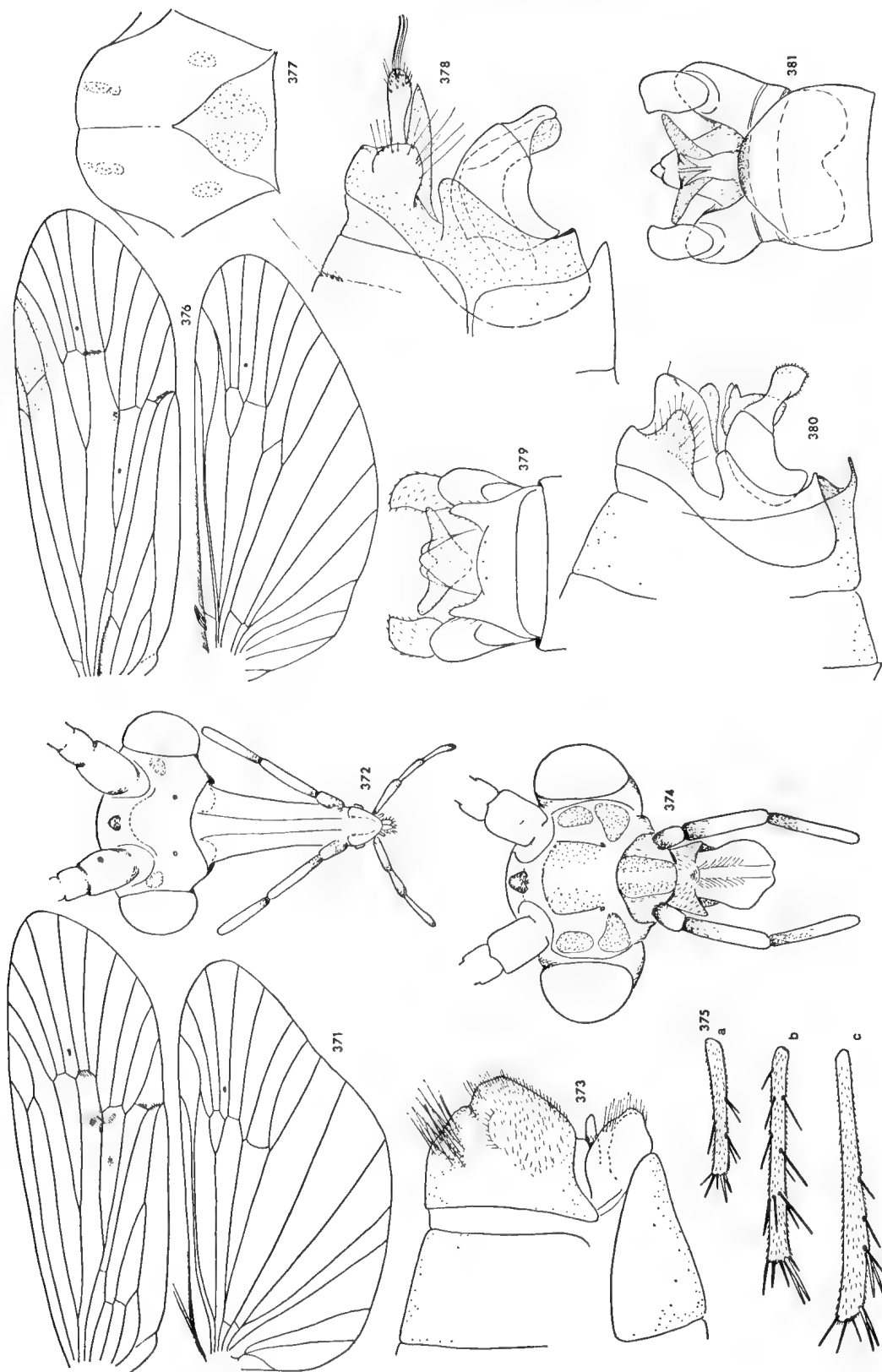
Figures 355-362—*Diplectrona lyella* sp. n.—♂ holotype King River  
—355, ♂ wings; 356, ♂ genitalia lateral; 357, ♂  
genitalia ventral; 358, ♂ genitalia dorsal; 359,  
♂ head dorsal; 360, ♂ mesonotum dorsal; 361, ♂  
abdomen, segments 5-7; 362, internal membra-  
neous organ, surface structure.

Figure 363—*Diplectrona bispinosa* Jacquemart—♂ holotype Sas-  
safras (?)—genitalia lateral, drawn from type prepara-  
tion (IRS<sub>C</sub>NB).

Figure 364—*Diplectrona tasmanica* Jacquemart—♂ Queenstown,  
genitalia lateral.

Figures 365-366—*Plectrotarsus gravenhorstii* Kolenati—♂ Bridge-  
water—365, ♂ genitalia lateral (phallus omitted);  
366, ♂ genitalia ventral.

Figures 367-370—*Plectrotarsus tasmanicus* Mosely—♂ 2 km NW of  
Derwent Bridge—367, ♂ genitalia lateral (phallus  
omitted); 368, ♂ genitalia ventral; 369, phallus  
dorsal; 370, phallus lateral.



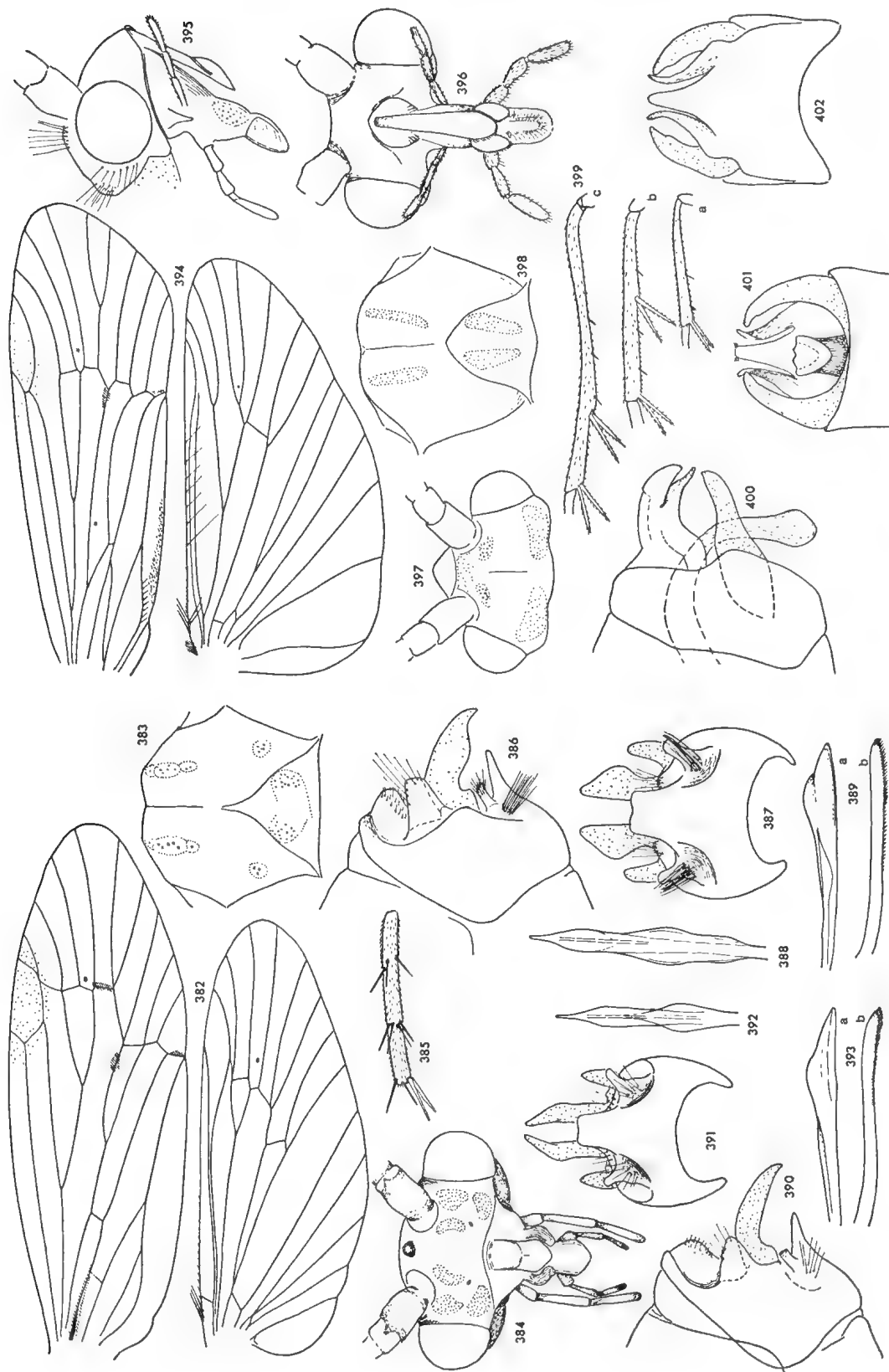
Figures 371-373—*Plectrotarsus tasmanicus* Mosely—♂ ♀ 2 km NW of Derwent Bridge—371, ♂ wings; 372, ♂ head, frontal view; 373, ♀ genitalia lateral.

Figures 374-375—*Liapota lavara* Neboiss—♂ Spring River—374, ♂ head, frontal view; 375, ♂ a—fore tibia; b—mid tibia; c—hind tibia.

Figures 376-378—*Liapota lavara* Neboiss—♂ Spring River—376, ♂ wings; 377, ♂ mesonotum dorsal; 378, ♂ genitalia lateral.

Figures 379-381—*Nanoplectrus truchantasi* sp. n.—♂ holotype West Arthur Plains—379, ♂ genitalia dorsal; 380, ♂ genitalia lateral; 381, ♂ genitalia ventral.





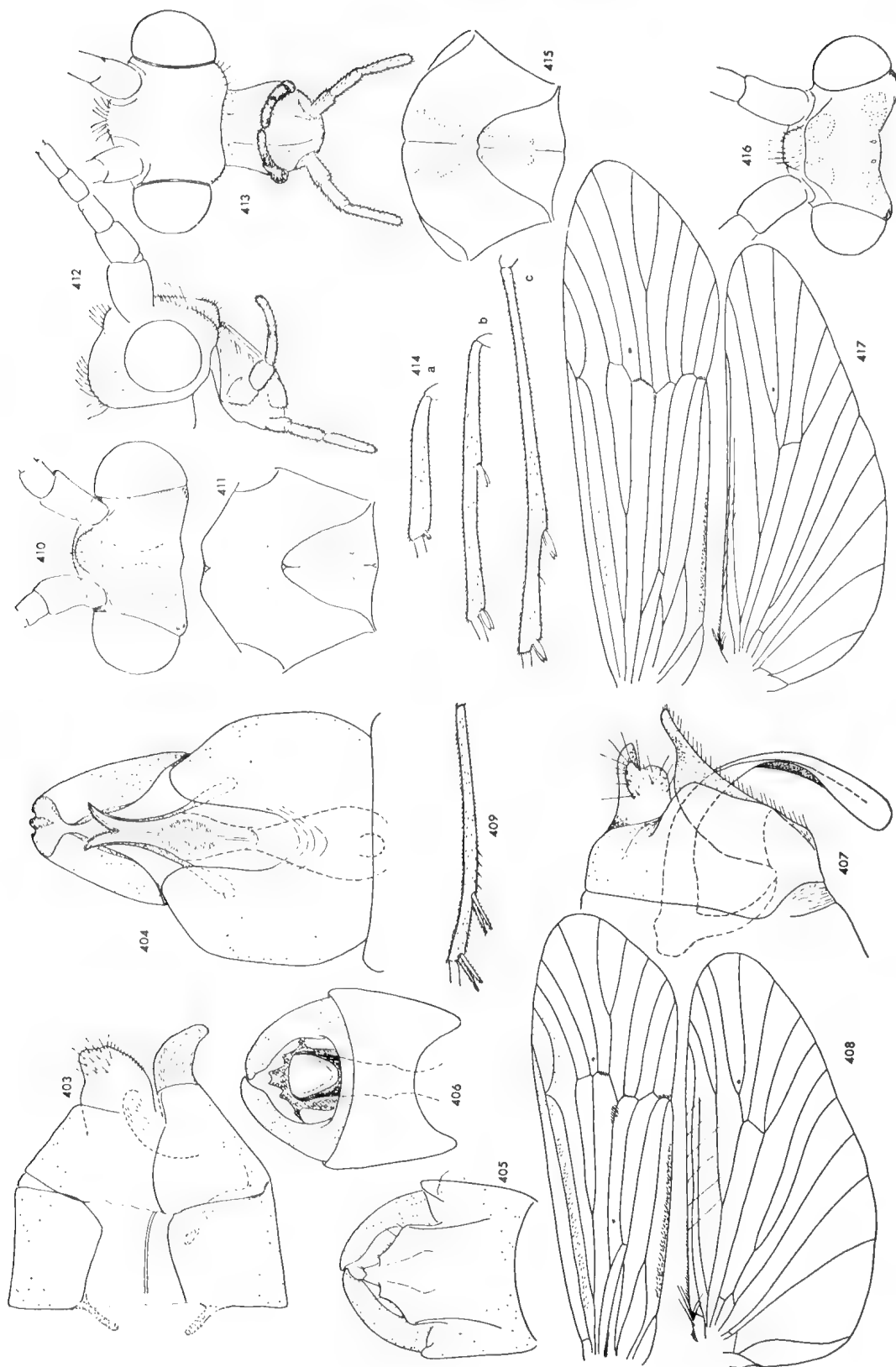
Figures 382-385—*Nanoplectrus truchanasi* sp. n.—♂ holotype West Arthur Plains—382, ♂ wings; 383, ♂ mesonotum dorsal; 384, ♂ head, frontal view; 385, mid-tibia.

Figures 386-389—*Archaeophylax ochreus* Mosely—♂ Cracroft River—386, ♂ genitalia lateral; 387, ♂ genitalia ventral; 388, phallus dorsal; 389, a—phallus lateral; b—paramere lateral.

Figures 390-393—*Archaeophylax vernalis* sp. n.—♂ holotype Lake Pedder—390, ♂ genitalia lateral; 391, ♂ genitalia

ventral; 392, phallus dorsal; 393, a—phallus lateral; b—paramere lateral.

Figures 394-402—*Taskiria austera* sp. n.—♂ paratype West Arthur Plains—394, ♂ wings; 395, ♂ head lateral; 396, ♂ head, frontal view; 397, ♂ head dorsal; 398, ♂ mesonotum dorsal; 399, ♂ a—fore tibia; b—mid tibia; c—hind tibia; 400, ♂ genitalia lateral; 401, ♂ genitalia ventral; 402, ♂ genitalia dorsal.

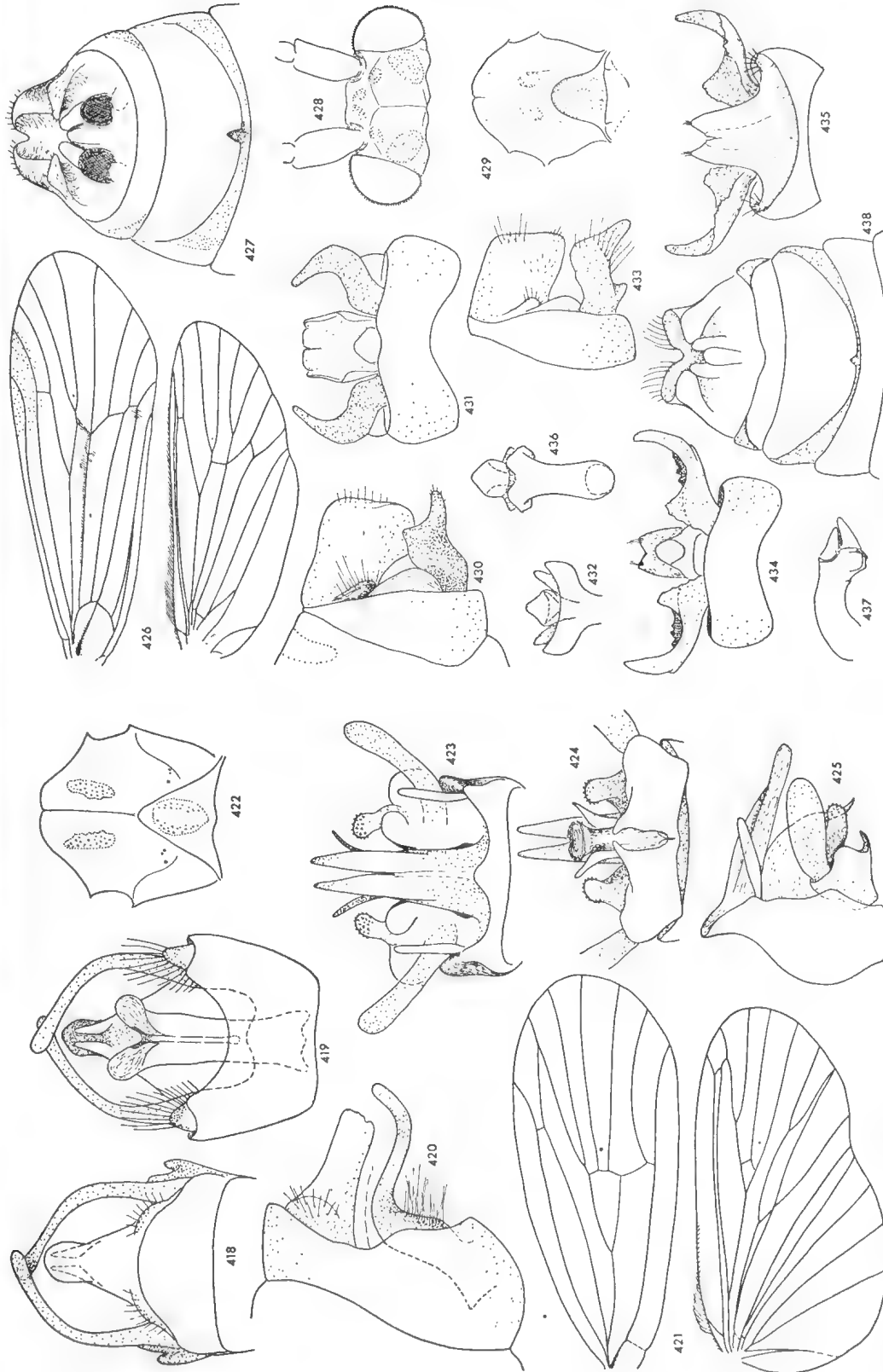


Figures 403-404—*Taskiria austera* sp. n.—♀ paratype West Arthur Plains—403, ♀ genitalia lateral; 404, ♀ genitalia ventral.

Figures 405-409—*Taskiria mccubbinii* sp. n.—♂ paratype Lake Pedder—405, ♂ genitalia dorsal; 406, ♂ genitalia ventral; 407, ♂ genitalia lateral; 408, ♂ wings; 409, ♂ hind tibia.

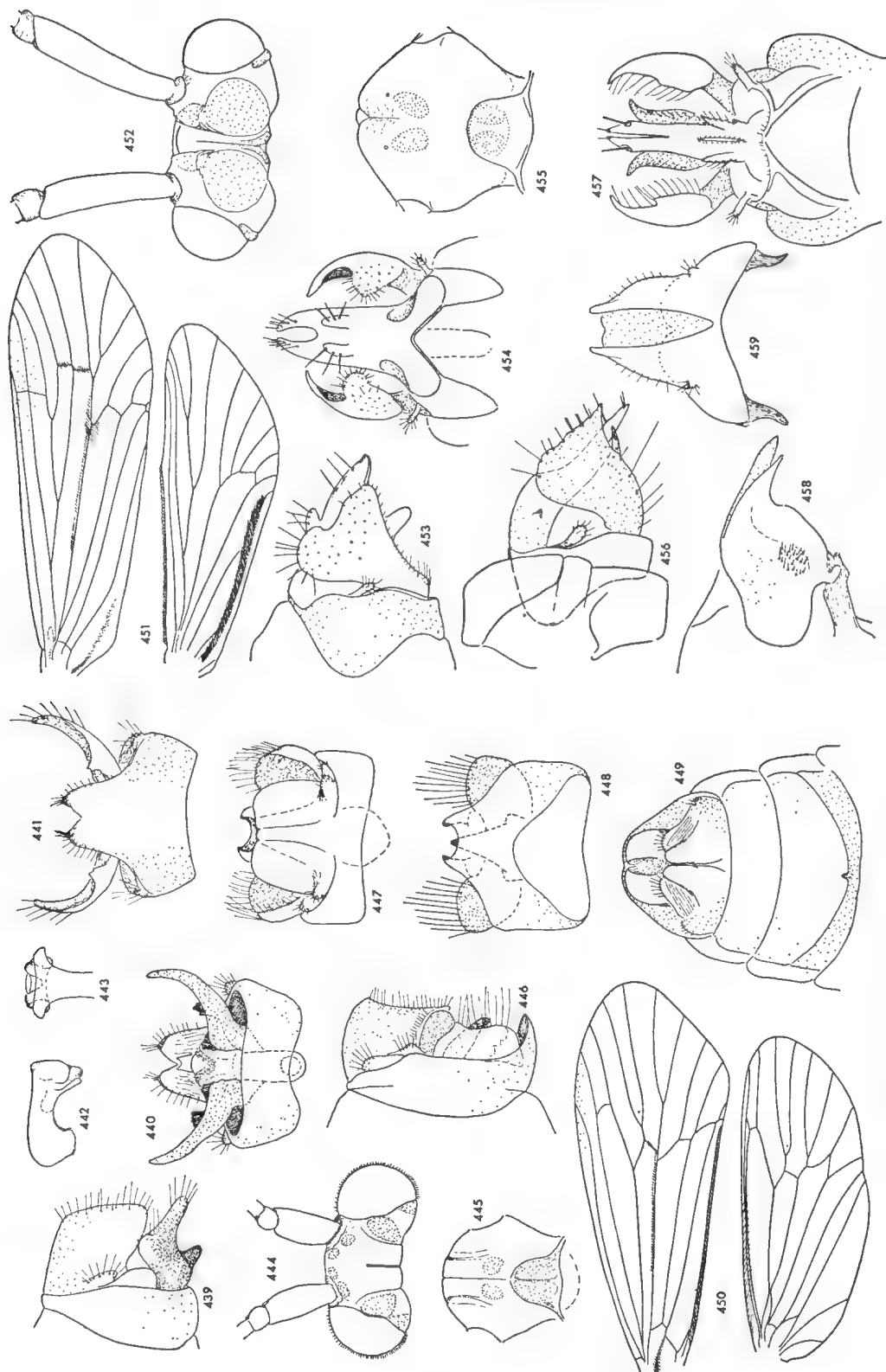
Figures 410-411—*Taskiria mccubbinii* sp. n.—♂ paratype Lake Pedder—410, ♂ head dorsal; 411, ♂ mesonotum dorsal.

Figures 412-417—*Taskiropsyche lacustris* sp. n.—♂ paratype Lake Pedder—412, ♂ head lateral; 413, ♂ head, frontal view; 414, ♂ a—fore tibia; b—mid tibia; c—hind tibia; 415, ♂ mesonotum dorsal; 416, ♂ head dorsal; 417, ♂ wings.



Figures 418-420—*Taskiropsyche lacustris* sp. n.—♂ paratype Lake Pedder—418, ♂ genitalia dorsal; 419, ♂ genitalia ventral; 420, ♂ genitalia lateral.  
 Figures 421-425—*Tasacuna ignota* Neboiss—♂ paratype Waldheim, Cradle Mtn.—421, ♂ wings; 422, ♂ mesonotum dorsal; 423, ♂ genitalia dorsal; 424, ♂ genitalia ventral; 425, ♂ genitalia lateral.  
 Figures 426-432—*Tasimia palpata* Mosely—♂ Scamander River, ♀

Westbury—426, ♂ wings; 427, ♀ genitalia ventral; 428, ♂ head dorsal; 429, ♂ mesonotum dorsal; 430, ♂ genitalia lateral; 431, ♂ genitalia ventral; 432, phallus, apex dorsal.  
 Figures 433-438—*Tasimia denticulata* Jacquemart—♂ ♀ St. Columba Falls—433, ♂ genitalia lateral; 434, ♂ genitalia ventral; 435, ♂ genitalia dorsal; 436, phallus dorsal; 437, phallus lateral; 438, ♀ genitalia ventral.



Figures 439-443—*Tasinia drepana* sp. n.—♂ paratype Huon-Picton River junction—439, ♂ genitalia lateral; 440, ♂ genitalia ventral; 441, ♂ genitalia dorsal; 442, phallus lateral; 443, phallus dorsal.

Figures 444-450—*Tasiagna ciliata* sp. n.—♂ paratype Port Arthur, ♀ paratype Andover—444, ♂ head dorsal; 445, ♂ mesonotum dorsal; 446, ♂ genitalia lateral; 447, ♂ genitalia dorsal; 448, ♂ genitalia ventral; 449, ♀

genitalia ventral; 450, ♂ wings. Figures 451-455—*Helicopsyche bartona* Mosely—♂ Guide River Falls—451, ♂ wings; 452, ♂ head dorsal; 453, ♂ genitalia lateral; 454, ♂ genitalia dorsal; 455, ♂ mesonotum dorsal. Figures 456-459—*Helicopsyche murrumba* Mosely—♀ Apsley River—456, ♂ genitalia lateral; 457, ♂ genitalia dorsal; 458, ♀ genitalia lateral; 459, ♀ genitalia dorsal.

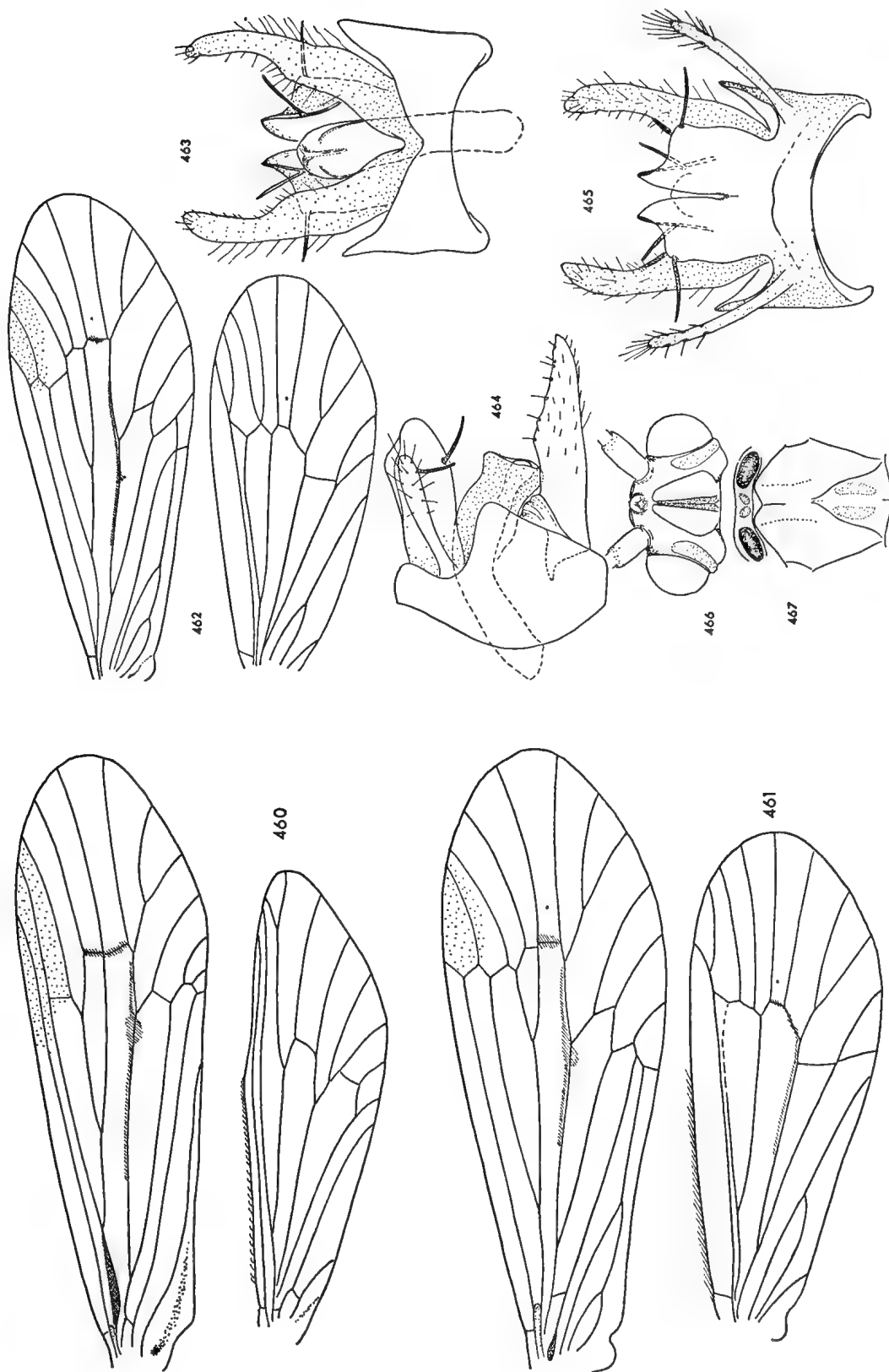
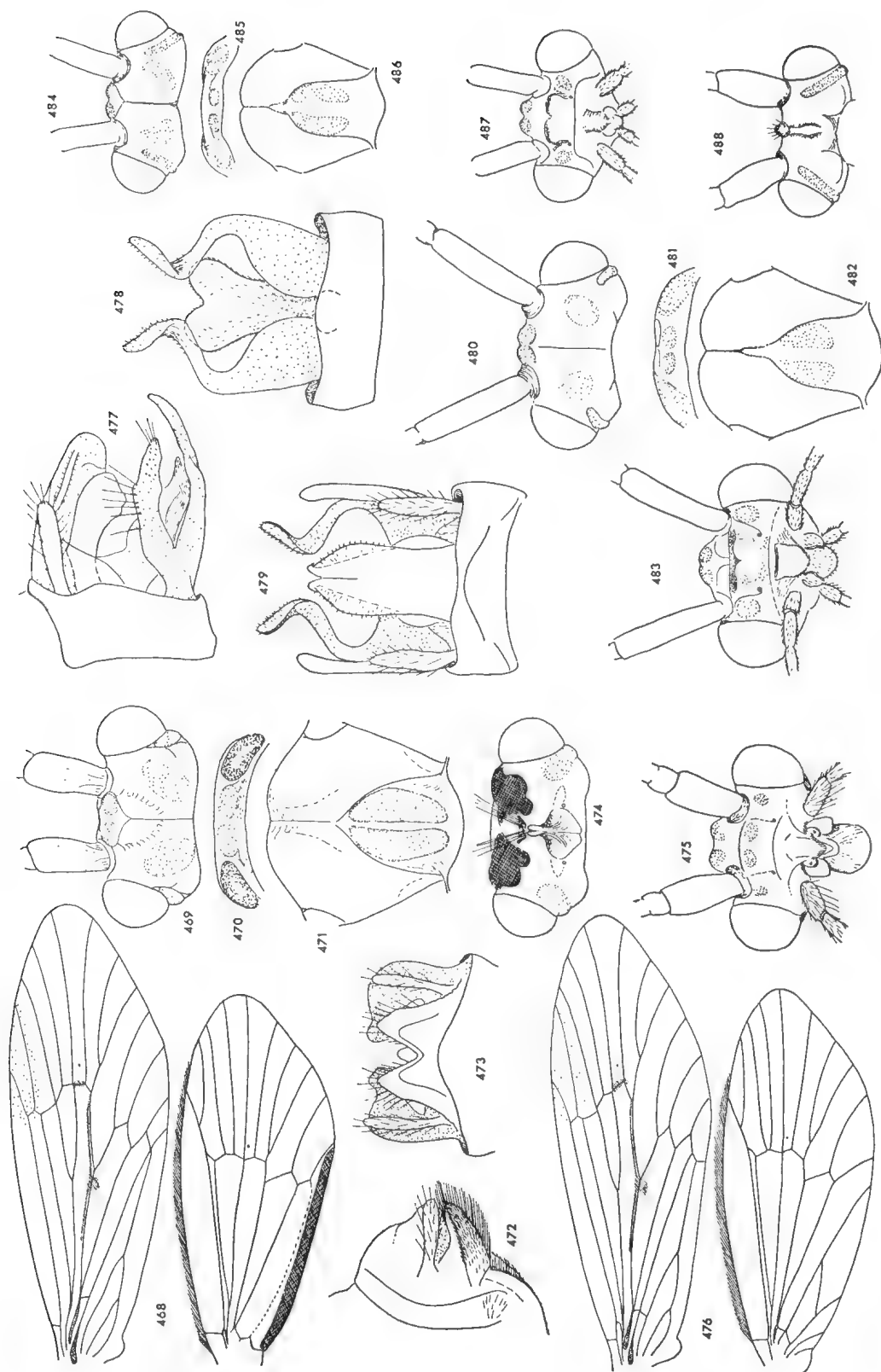


Figure 460—*Helicopsyche murrumba* Mosely—♂  
Apsley River, wings.

Figure 461—*Caloca saneva* (Mosely)—♂ Dove River,  
Cradle Mtn., wings.

Figures 462-467—*Caloca ascia* sp. n.—♂ holotype  
Lake St. Clair—462, ♂ wings; 463,  
♂ genitalia ventral; 464, ♂ genitalia lateral; 465, ♂ genitalia dorsal; 466, ♂ head dorsal; 467, ♂ pronotum and mesonotum dorsal.

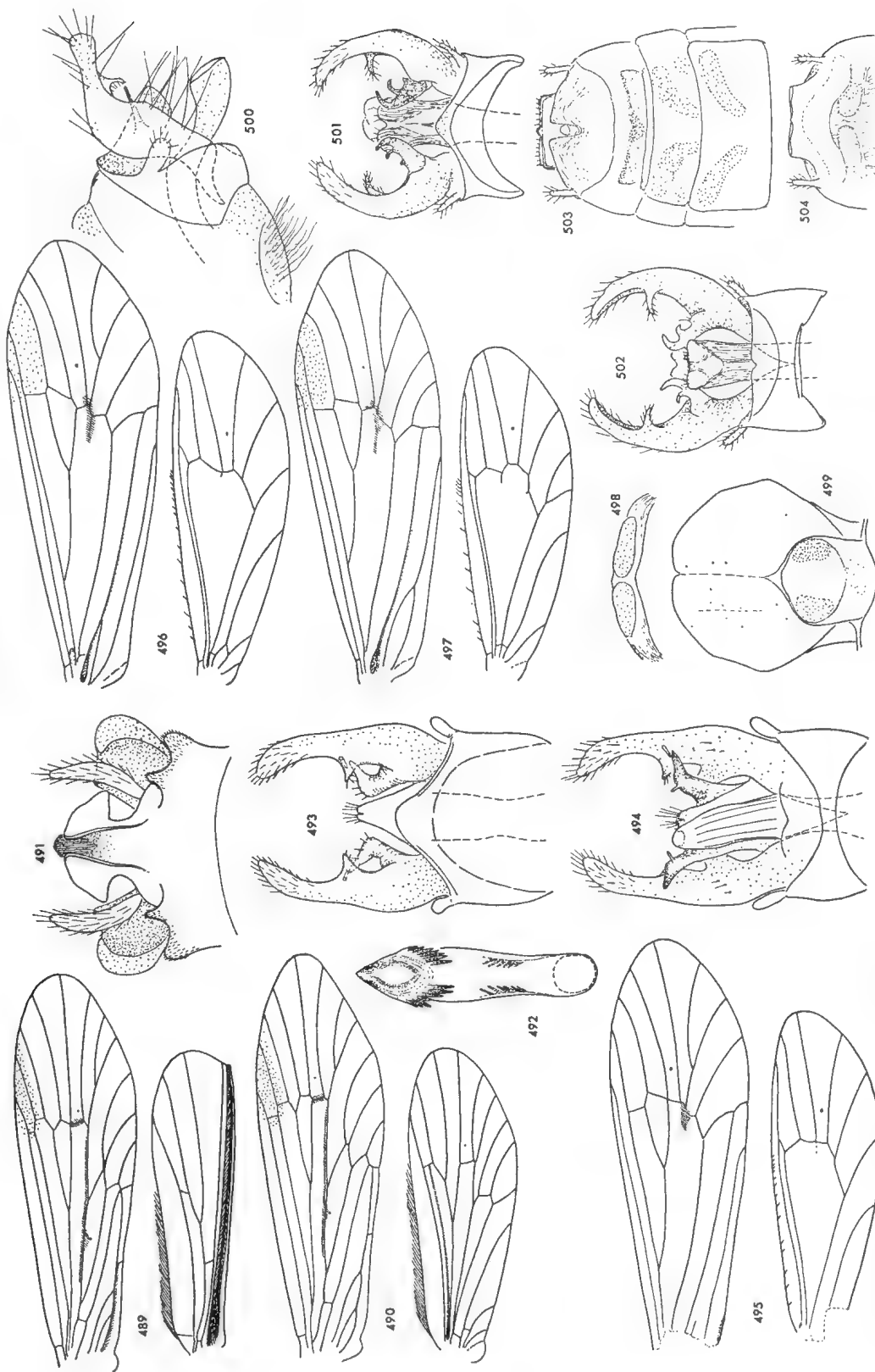


Figures 468-476—*Caenota plicata* Mosely—♂ ♀ Corinna—468, ♂ wings; 469, ♀ head dorsal; 470, ♀ pronotum dorsal; 471, ♀ mesonotum dorsal; 472, ♀ genitalia lateral; 473, ♀ genitalia dorsal; 474, ♂ head dorsal (antennae removed at base); 475, ♀ head, frontal view; 476, ♀ wings.

Figures 477-479—*Caenota plicata* Mosely—♂ Corinna—477, ♂ genitalia lateral; 478, ♂ genitalia ventral; 479, ♂ genitalia dorsal.

Figures 480-483—*Pychocentrella eruensis* Mosely—♀ Mt. Egmont, New Zealand—480, ♀ head dorsal; 481, ♀ pronotum dorsal; 482, ♀ mesonotum dorsal; 483, ♀ head, frontal view.

Figures 484-488—*Tamasia variegata* Mosely—♂ Grt. Forester River, ♀ Iris River trib—484, ♀ head dorsal; 485, ♀ pronotum dorsal; 486, ♀ mesonotum dorsal; 487, ♀ head, frontal view; 488, ♂ head dorsal.



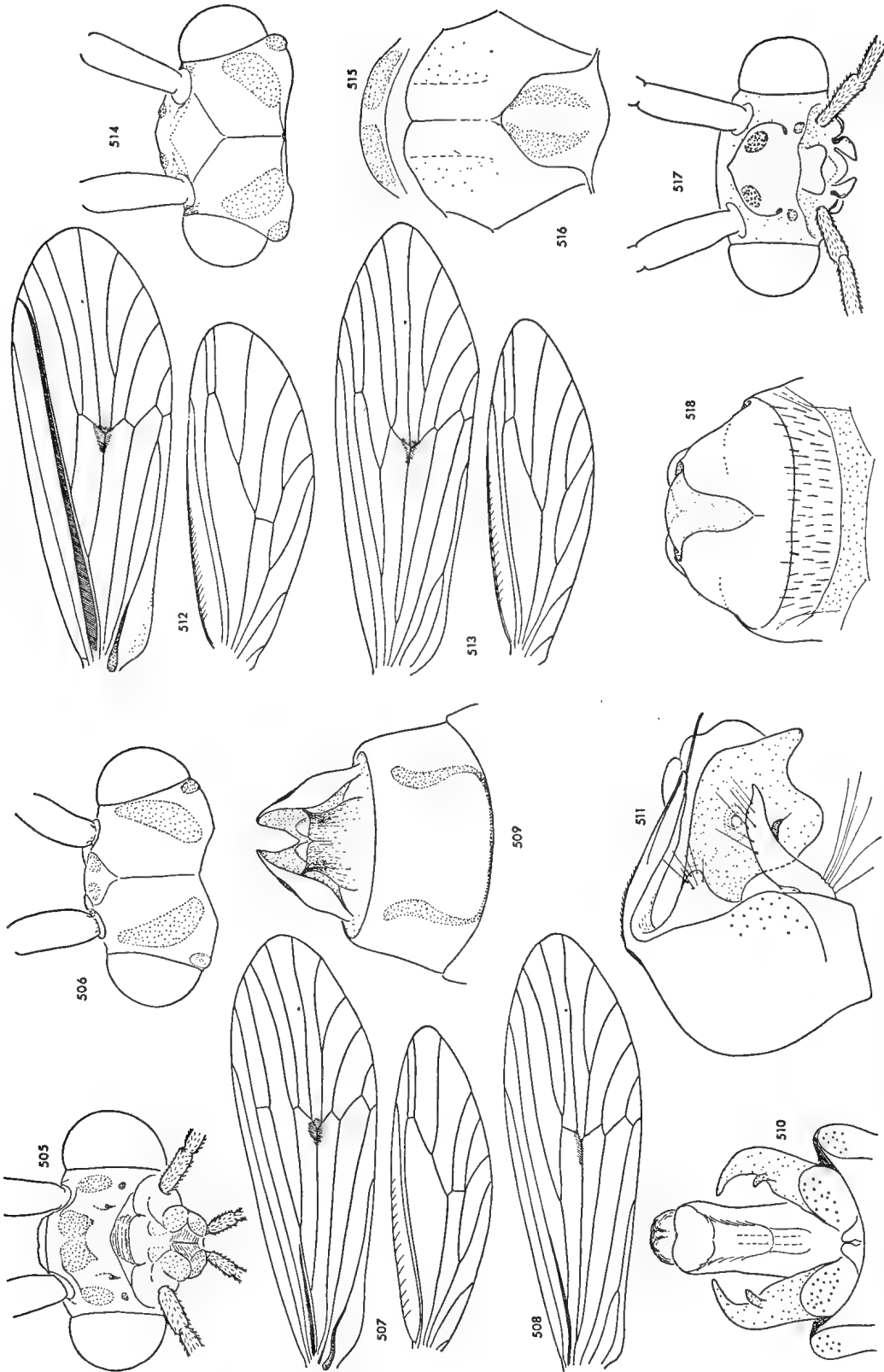
Figures 489-492—*Tamasia variegata* Mosely—♂ Grt. Forester River—489, ♂ wings; 490, ♀ wings; 491, ♂ genitalia dorsal; 492, phallus ventral.

Figures 493-495—*Helicophya astia* Mosely—493, ♂ genitalia dorsal; 494, ♂ genitalia ventral; both drawings from a microscope slide in IRScNB, labelled '*delamarei*, Cradle 23-1-23' (for explanation see text); 495,

♂ wings from a slide in IRScNB, labelled '*marlieri*, Mt. Wellington 24.xi.22'.

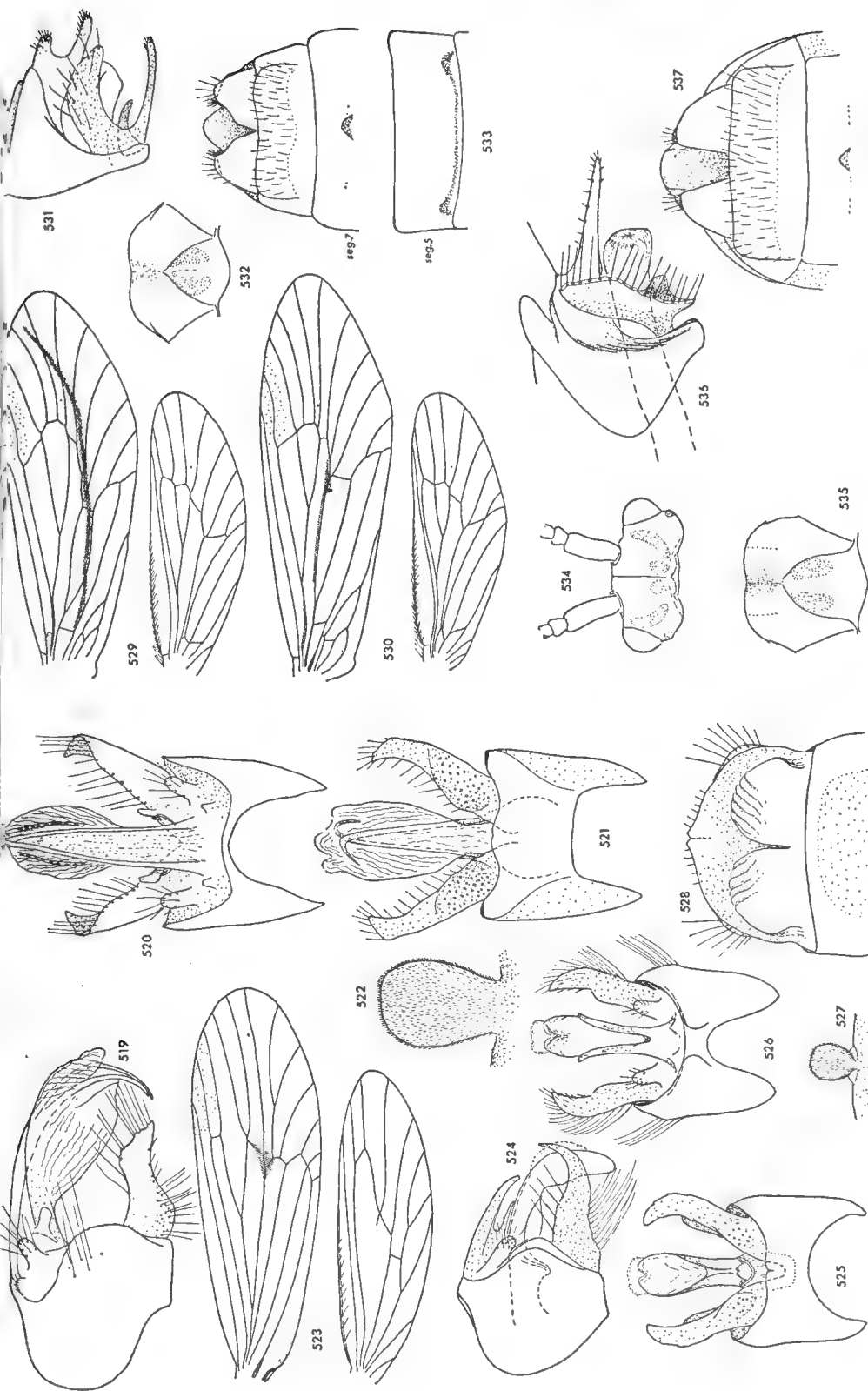
Figures 496-504—*Helicophya delamarei* Jacquemart—♂ Corinna, ♀ Bluff Hill Creek—496, ♂ wings; 497, ♀ wings; 498, ♀ pronotum dorsal; 499, ♀ mesonotum dorsal; 500, ♂ genitalia lateral; 501, ♂ genitalia dorsal; 502, ♂ genitalia ventral; 503, ♀ genitalia ventral; 504, ♀ genitalia dorsal.





Figures 505-506—*Helicophya delamarei* Jacquemart—  
 ♀ Bluff Hill Creek—505, ♀ head, frontal view; 506, ♀ head dorsal.  
 Figures 507-511—*Alloeocella grisea* Banks—♂ St. Columba Falls, ♀ Duck River—507, ♂ wings; 508, ♀ anterior wing; 509, ♀ genitalia ventral; 510, ♂ genitalia ventral; 511, ♂ genitalia lateral.

Figures 512-518—*Alloeocella longispina* Jacquemart—  
 ♂ ♀ Waldheim, Cradle Mtn.—512, ♂ wings; 513, ♂ head dorsal; 515, ♂ pronotum dorsal; 516, ♂ mesonotum dorsal; 517, ♂ head, frontal view; 518, ♀ genitalia ventral.

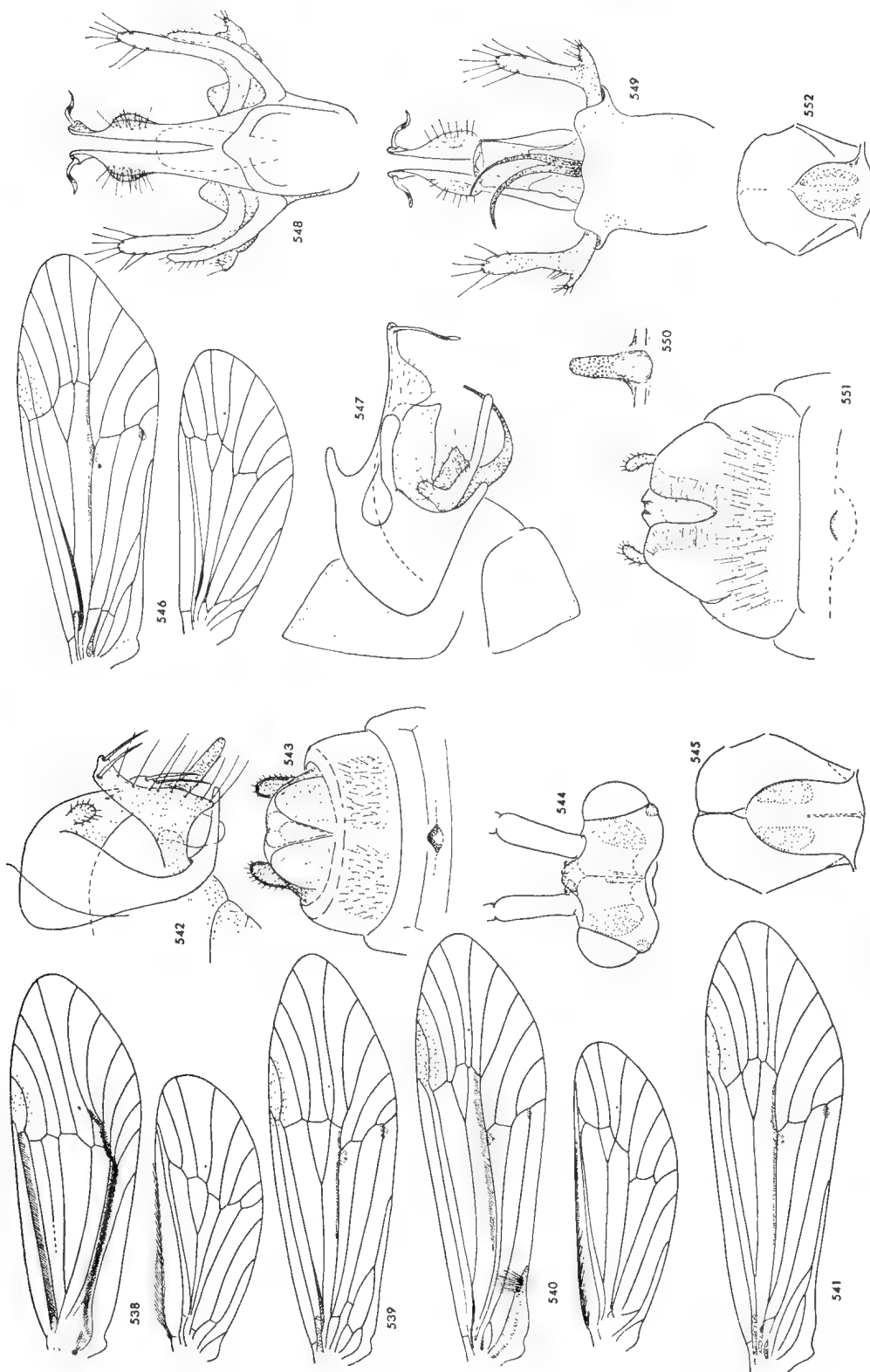


Figures 529-533—*Hampa patona* Mosely—♂ ♀ Henty River nr. Queenstown—529, ♂ wings; 530, ♀ wings; 531, ♂ genitalia lateral; 532, ♂ mesonotum dorsal; 533, ♀ part of abdomen and genitalia ventral.

Figures 534-537—*Matasia satana* Mosely—♂ ♀ Arve River—534, ♀ head dorsal; 535, ♀ mesonotum dorsal; 536, ♂ genitalia lateral; 537, ♀ genitalia ventral

Figures 519-522—*Alloecella longispina* Jacquemart—♂ Waldheim, Cradle Mtn.—519, ♂ genitalia lateral; 520, ♂ genitalia dorsal; 521, ♂ genitalia ventral; 522, ♂ sternite 7, ventral process.

Figures 523-528—*Alloecella pilosa* sp. n.—♂ paratype Liena, ♀ paratype Lake Lilla, Cradle Mtn.—523, ♂ wings; 524, ♂ genitalia lateral; 525, ♂ genitalia ventral; 526, ♂ genitalia dorsal; 527, ♂ sternite 7, ventral process; 528, ♀ genitalia ventral.



Figures 538-539—*Matasia satana* Mosely—♂ ♀ Arve River—538, ♂ wings; 539, ♀ anterior wing.

Figures 540-545—*Costora delora* Mosely—♂ ♀ Scamander River—540, ♂ wings; 541, ♀ anterior wing; 542, ♂ genitalia lateral; 543, ♀ genitalia ventral; 544, ♀ head dorsal; 545, ♀ mesonotum dorsal.

Figures 546-552—*Costora ebenina* sp. n.—♂ paratype Mole Creek, ♀ allotype Bull Creek, Cradle Mtn. Road—546, ♀ wings; 547, ♂ genitalia lateral; 548, ♂ genitalia dorsal; 549, ♂ genitalia ventral; 550, ♂ ventral process, sternite 7; 551, ♀ genitalia ventral; 552, ♂ mesonotum dorsal.

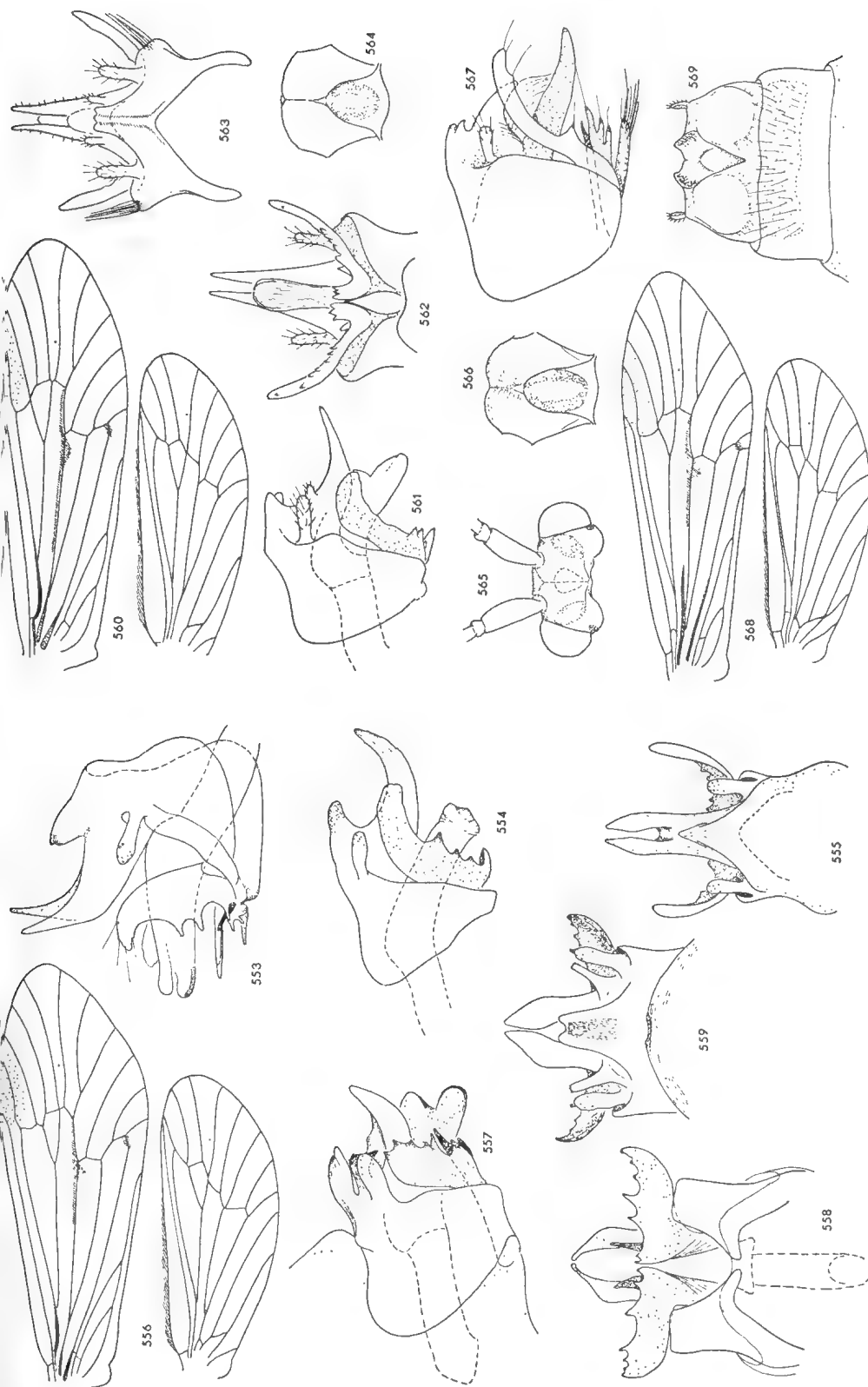


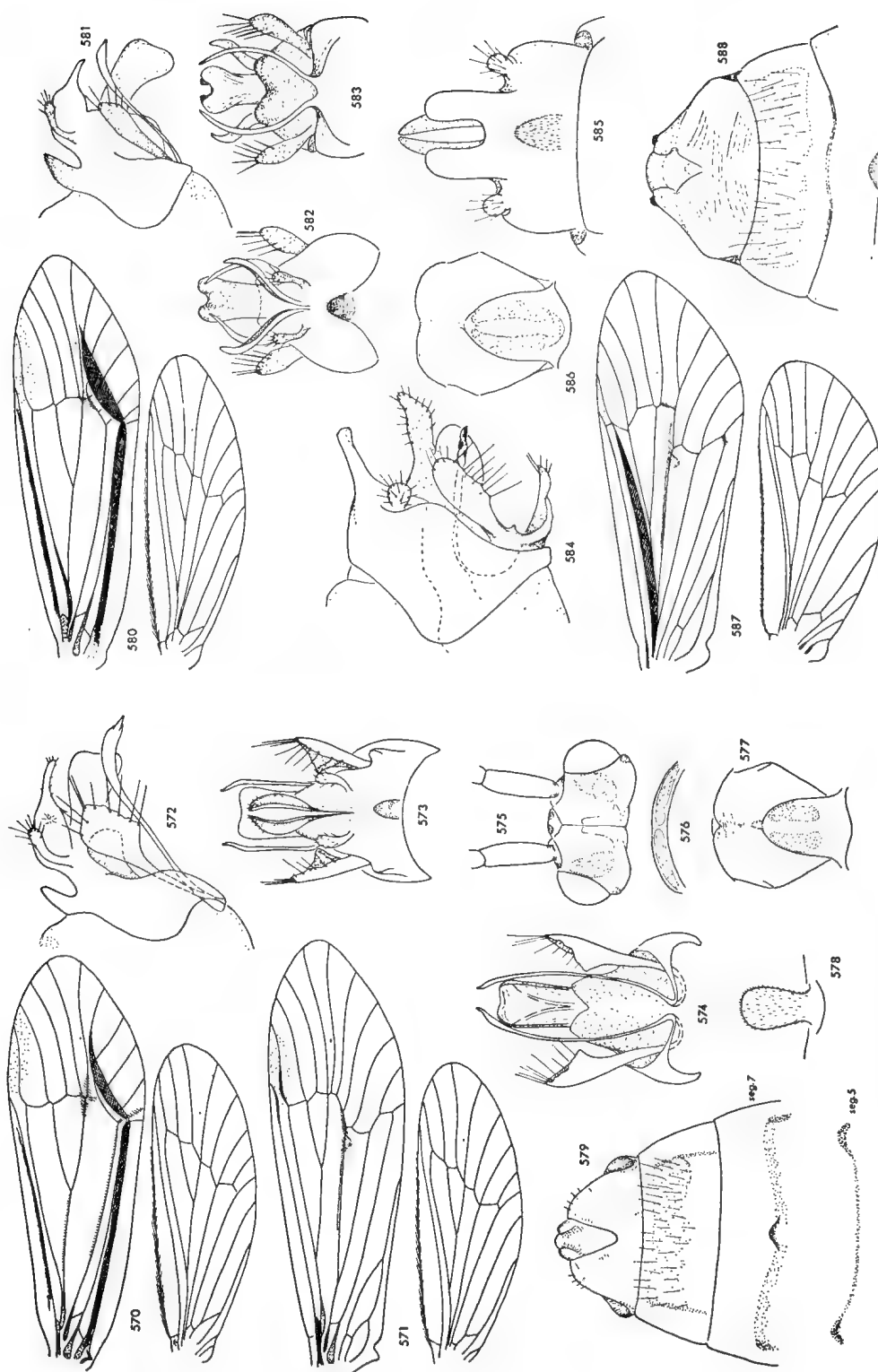
Figure 553—*Costora ramosa* Jacquemart—♂ holotype Geeveston—genitalia lateral, drawn from holotype preparation (IRSeNB).

Figures 554-555—*Costora krene* sp. n.—♂ holotype Spring River—554, ♂ genitalia lateral; 555, ♂ genitalia dorsal.

Figures 556-559—*Costora seposita* sp. n.—♂ holotype Marakooa Caves—556, ♂ wings; 557, ♂ genitalia lateral; 558, ♂ genitalia ventral; 559, ♂ genitalia dorsal.

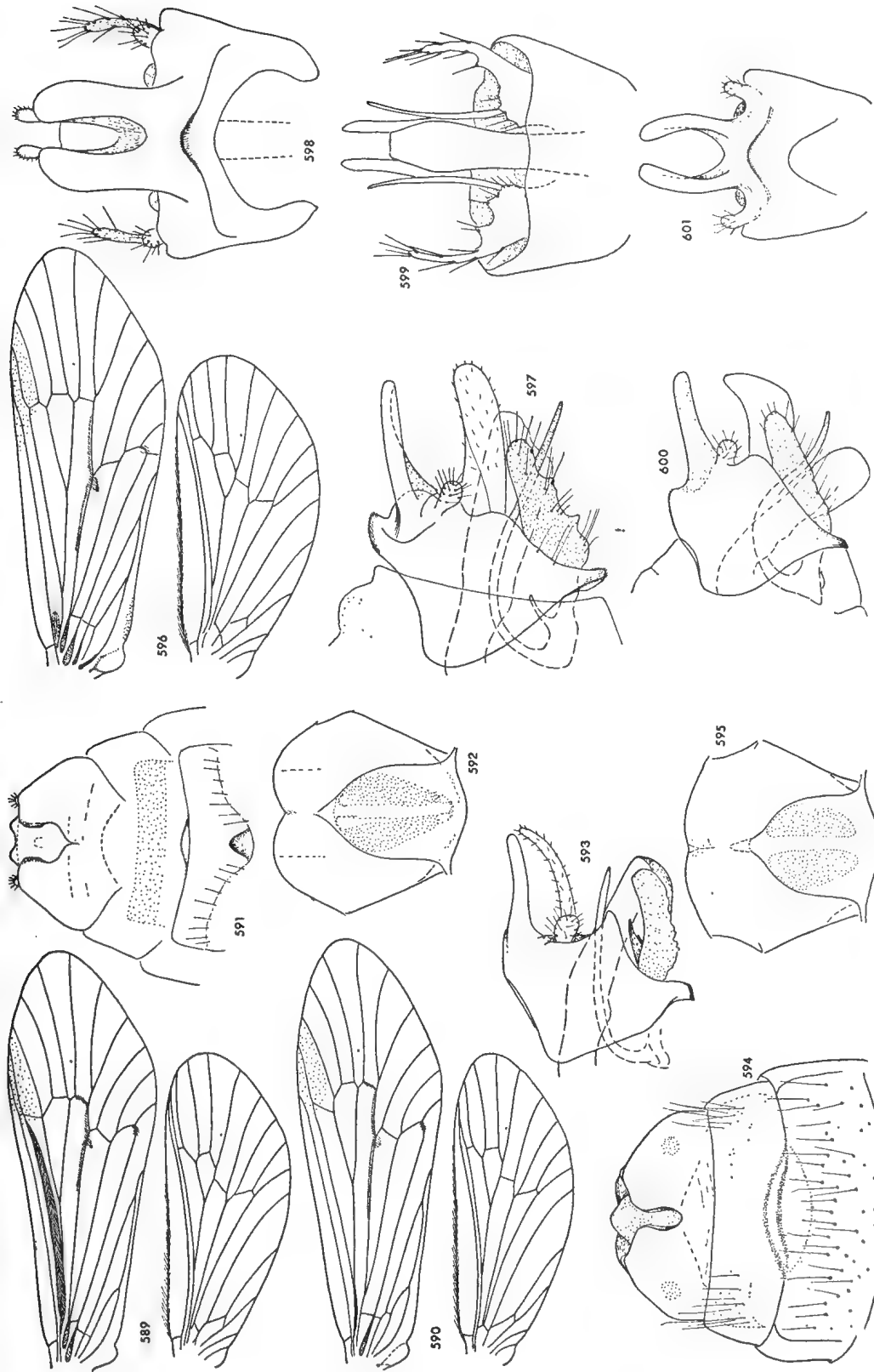
Figures 560-564—*Costora luxata* sp. n.—♂ paratype Waldheim, Cradle Mtn.—560, ♂ wings; 561, ♂ genitalia lateral; 562, ♂ genitalia ventral; 563, ♂ genitalia dorsal; 564, ♂ mesonotum dorsal.

Figures 565-569—*Costora rotosca* Mosely—♂ ♀ Huon-Picton River junction—565, ♂ head dorsal; 566, ♂ mesonotum dorsal; 567, ♂ genitalia lateral; 568, ♂ wings; 569 ♀ genitalia ventral.



Figures 570-579—*Lingora aurata* Mosely—♂ Targa, ♀ Bradys Lake—570, ♂ wings; 571, ♀ wings; 572, ♂ genitalia lateral; 573, ♂ genitalia dorsal; 574, ♂ genitalia ventral; 575, ♀ head dorsal; 576, ♀ pronotum dorsal; 577, ♀ mesonotum dorsal; 578, ♂ ventral process, sternite 7; 579, ♀ part of abdomen and genitalia ventral.

Figures 580-583—*Lingora vesca* sp. n.—♂ holotype North Esk, Blessington—580, ♂ wings; 581, ♂ genitalia lateral; 582, ♂ genitalia dorsal; 583, ♂ genitalia ventral.  
Figures 584-588—*Conosicus fromus* Mosely—♂ ♀ Ulverstone—584, ♂ genitalia lateral; 585, ♂ genitalia dorsal; 586, ♂ mesonotum dorsal; 587, ♂ wings; 588 ♀ genitalia ventral

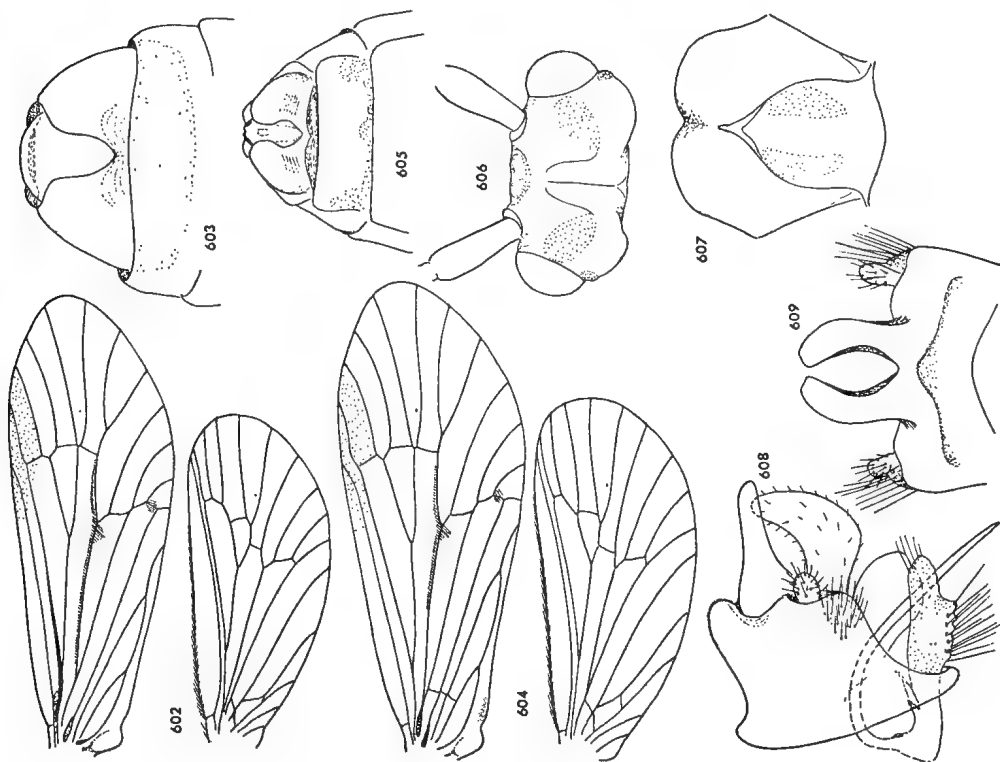


Figures 589-593—*Conoesucus norelus* Mosely—♂ ♀ Targa—589, ♂ wings; 590, ♀ wings; 591, ♀ genitalia ventral; 592, ♀ mesonotum dorsal; 593, ♂ genitalia lateral.

Figures 594-595—*Conoesucus digitiferus* Jacquemart—♀ Waldheim, Cradle Mtn.—594, ♀ genitalia ventral; 595, ♀ mesonotum dorsal.

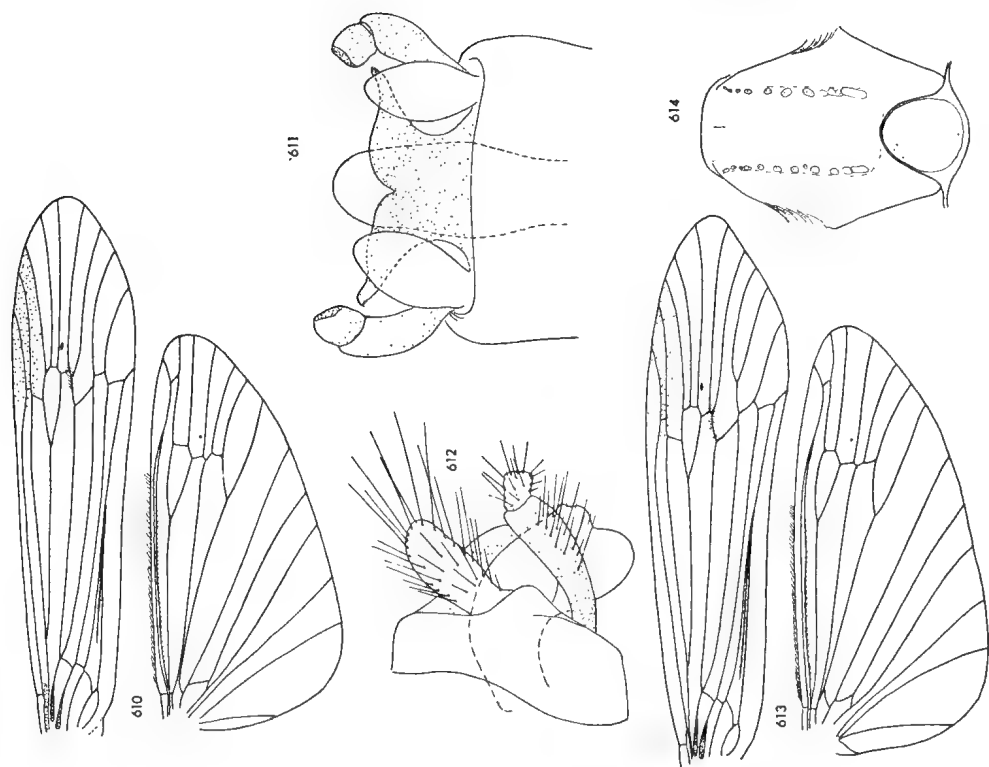
Figures 596-599—*Conoesucus digitiferus* Jacquemart—♂ Waldheim, Cradle Mtn.—596, ♂ wings; 597, ♂ genitalia lateral; 598, ♂ genitalia dorsal; 599, ♂ genitalia ventral.

Figures 600-601—*Conoesucus nepotulus* sp. n.—♂ paratype Dip River Falls—600, ♂ genitalia lateral; 601, ♂ genitalia dorsal.

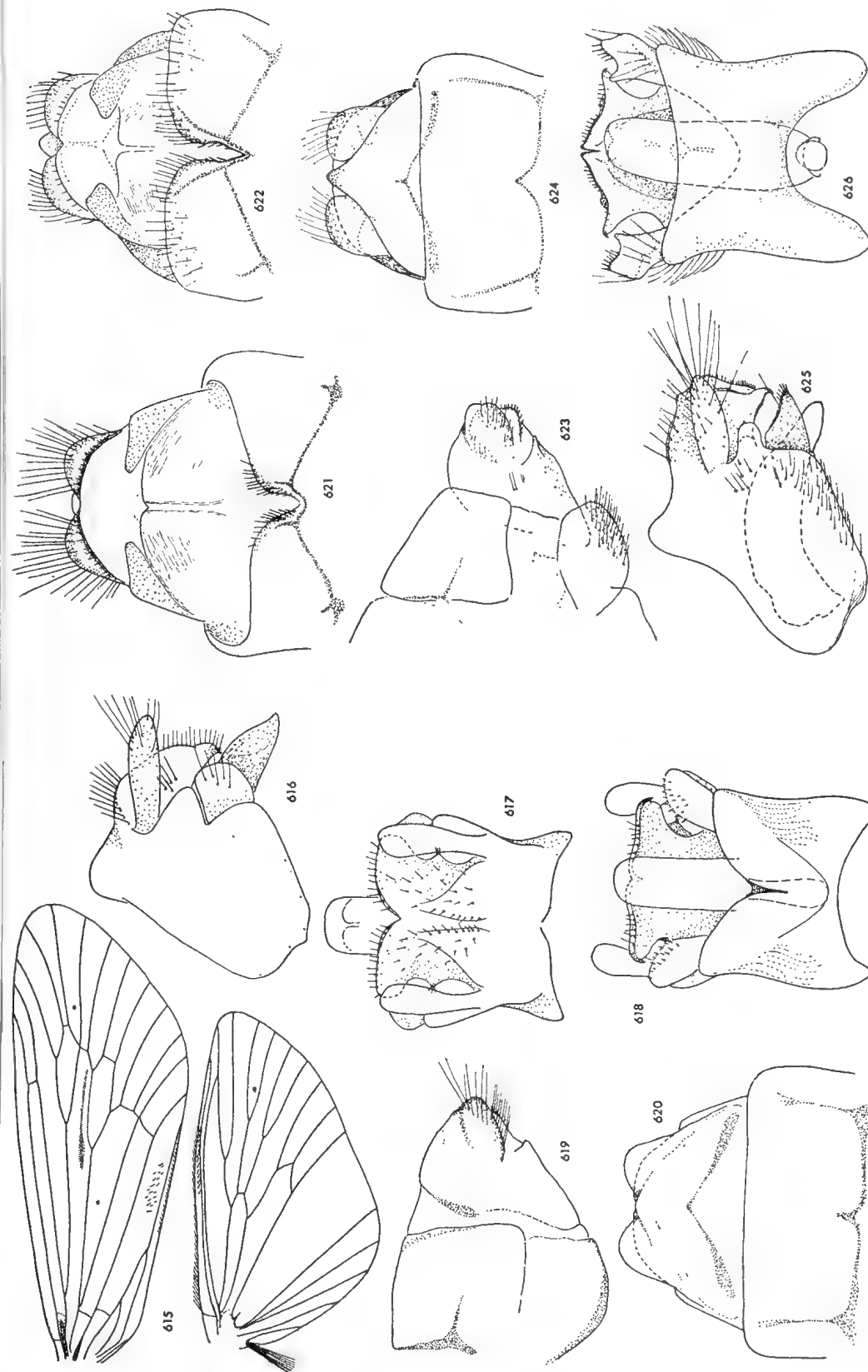


Figures 602-603—*Conoesucus nepotulus* sp. n.—♂ ♀ paratypes Dip River Falls—602, ♂ wings; 603, ♀ genitalia ventral.

Figures 604-609—*Conoesucus brontensis* sp. n.—♂ ♀ paratypes 5 km W of Bronte—604, ♂ wings; 605, ♀ genitalia ventral; 606, ♀ head dorsal; 607, ♀ mesonotum dorsal; 608, ♂ genitalia lateral; 609, ♂ genitalia dorsal.



Figures 610-614—*Atriplectides dubia* Mosely—♂ ♀ Lake Pedder—610, ♂ wings; 611, ♂ genitalia dorsal; 612, ♂ genitalia lateral; 613, ♀ wings; 614, ♀ mesonotum dorsal.

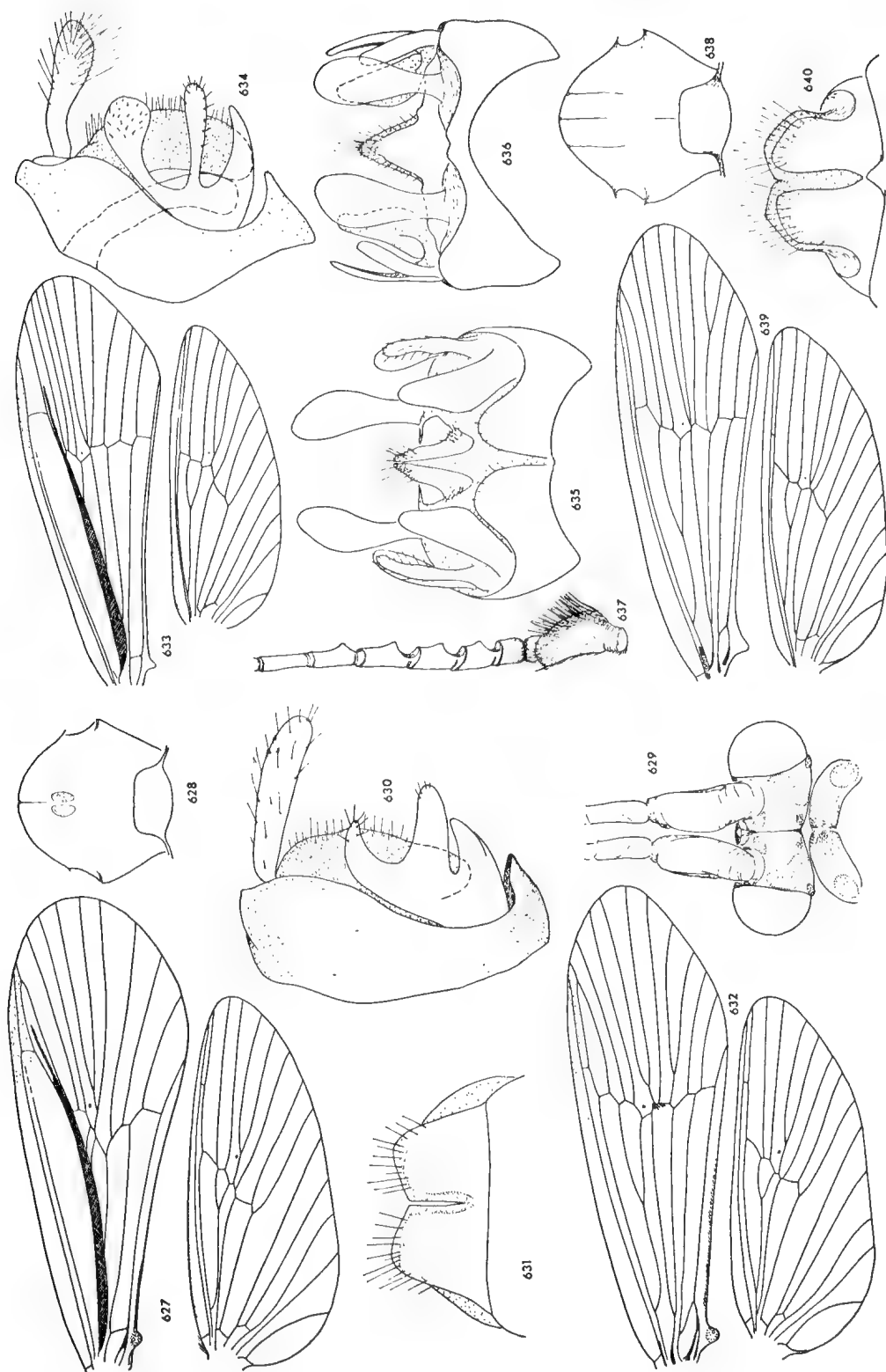


Figures 615-620—*Anisocentropus latifascia* (Walker)—♂  
 (Walker)—♂ ♀ Macquarie River 8 km W Campbell Town—615, ♂ (New Norfolk) wings; 616, ♂ genitalia lateral; 617, ♂ genitalia dorsal; 618, ♂ genitalia ventral; 619, ♀ genitalia lateral; 620, ♀ genitalia dorsal.

Figure 621—*Anisocentropus latifascia* (Walker)—♀  
 Macquarie River 8 km W Campbell Town, genitalia ventral.

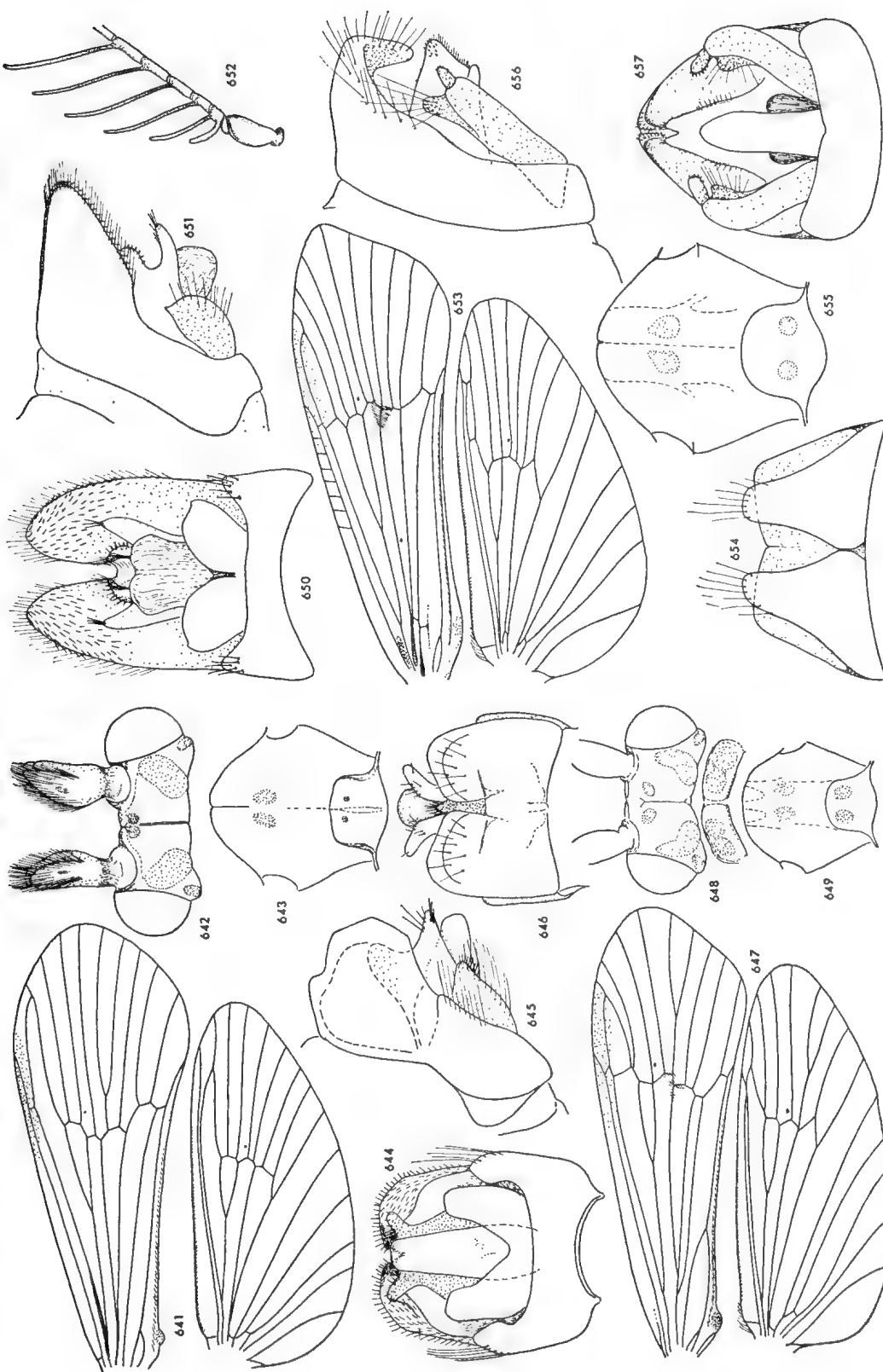
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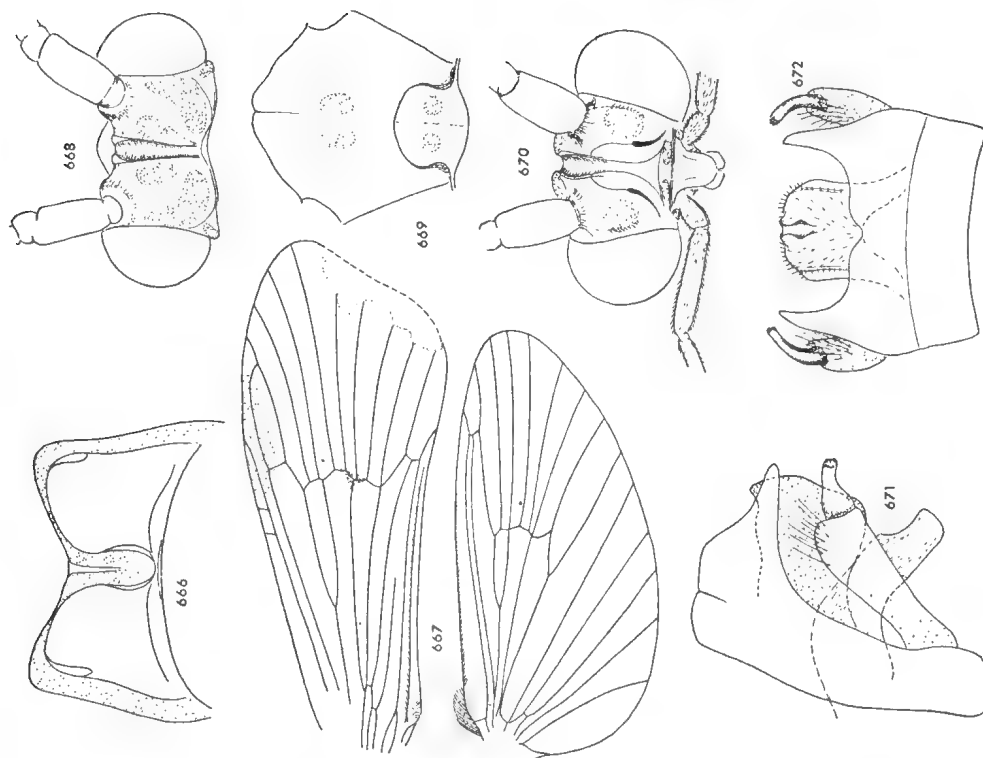
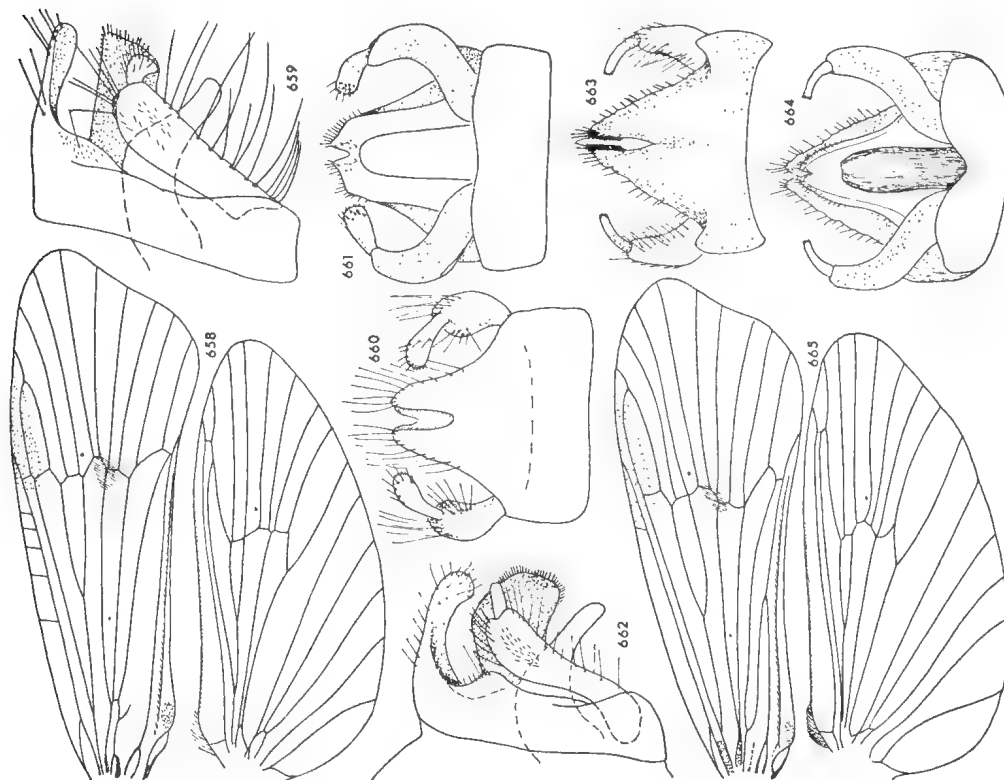
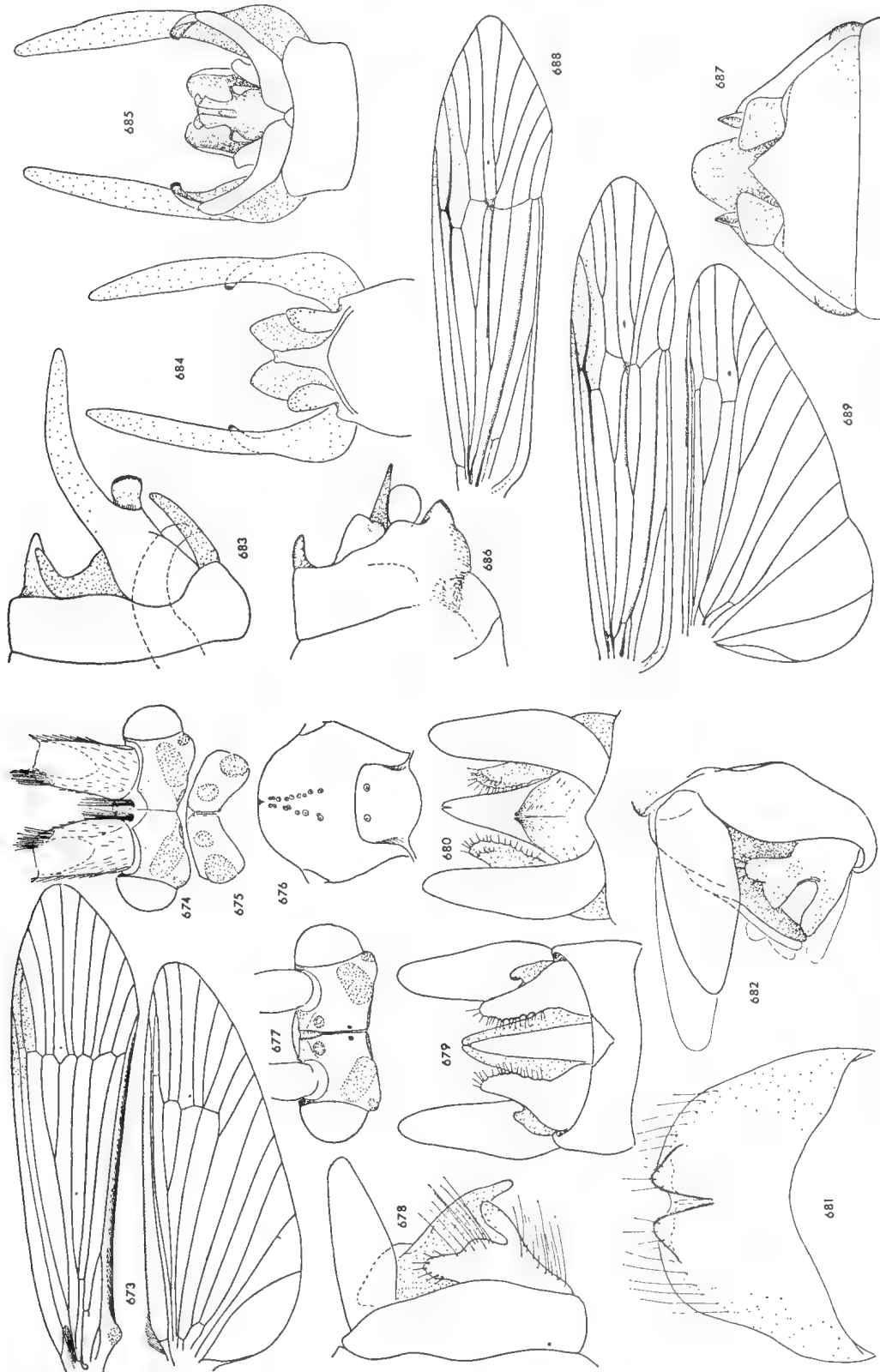


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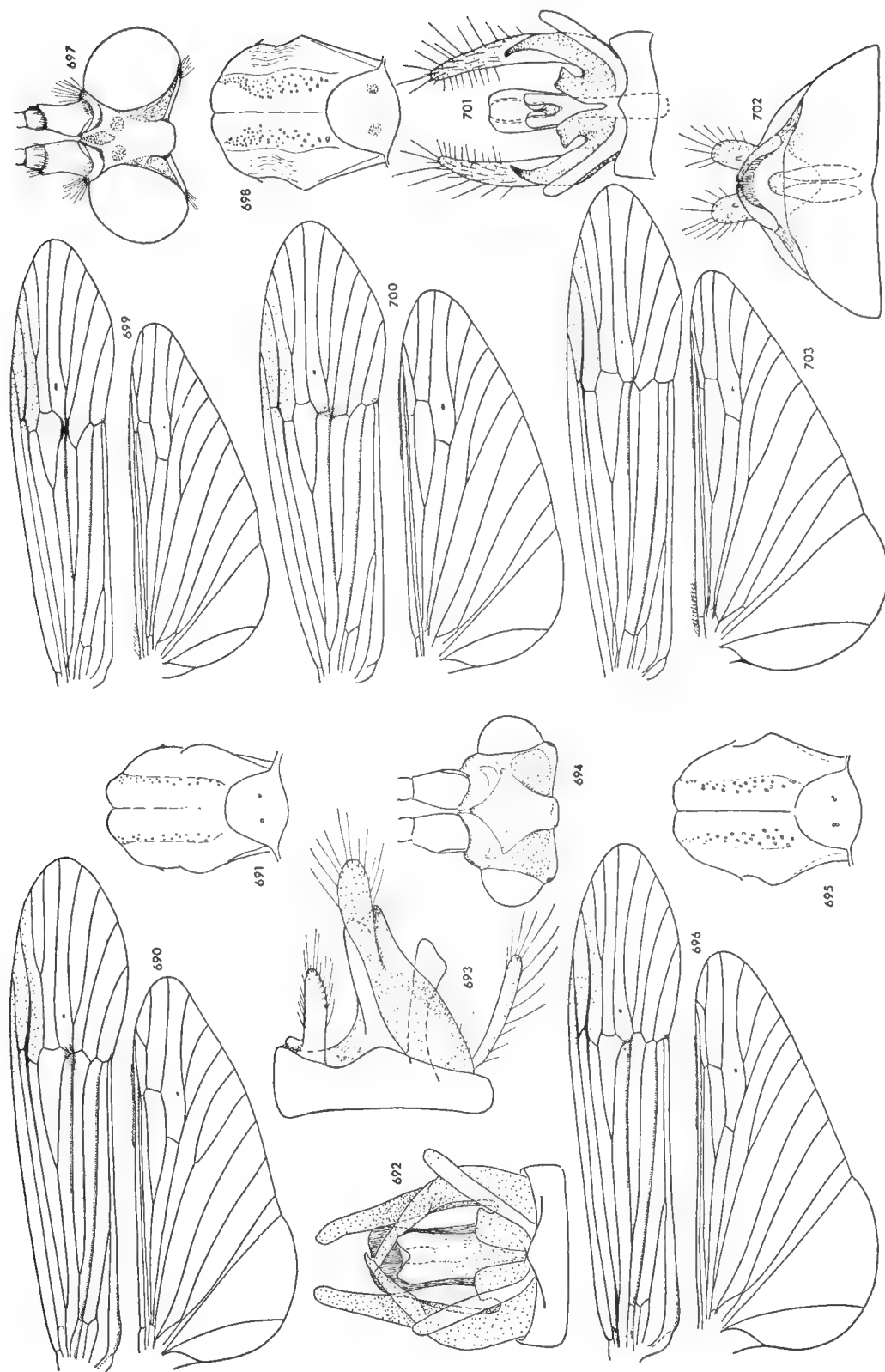


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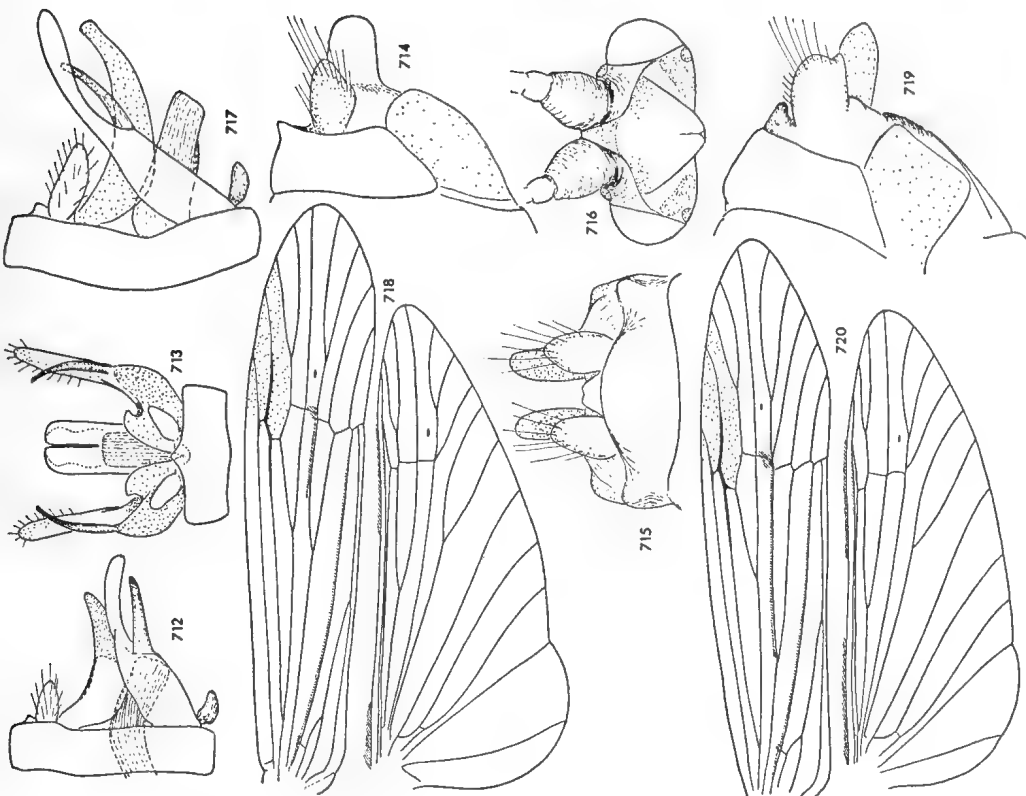
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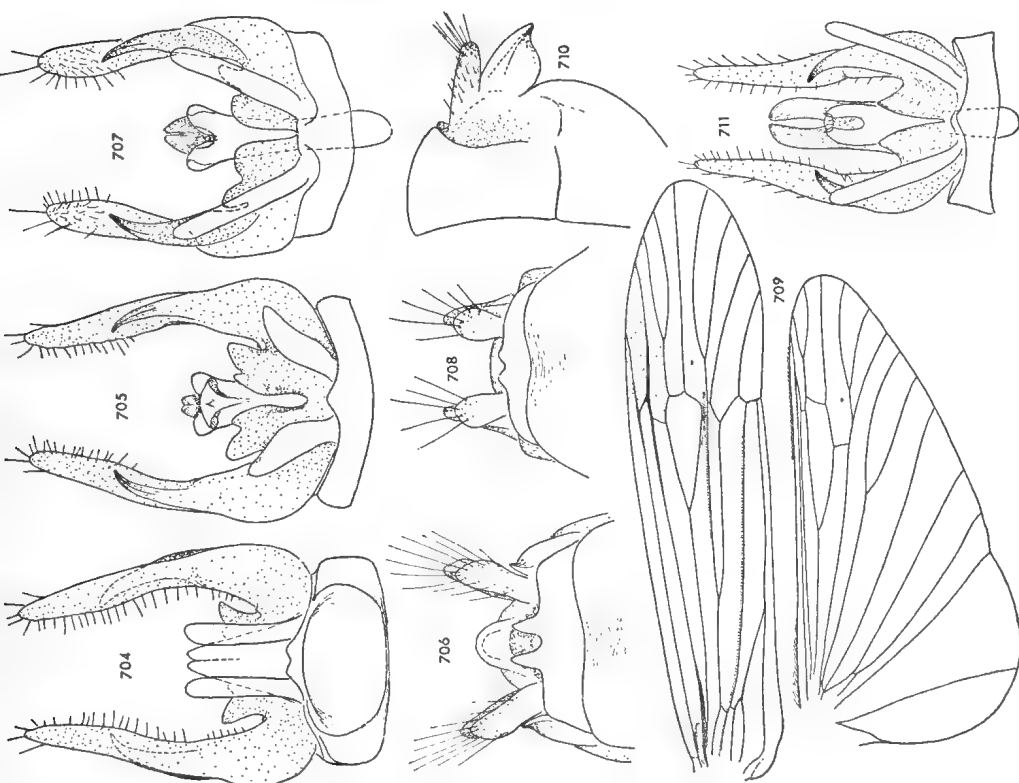
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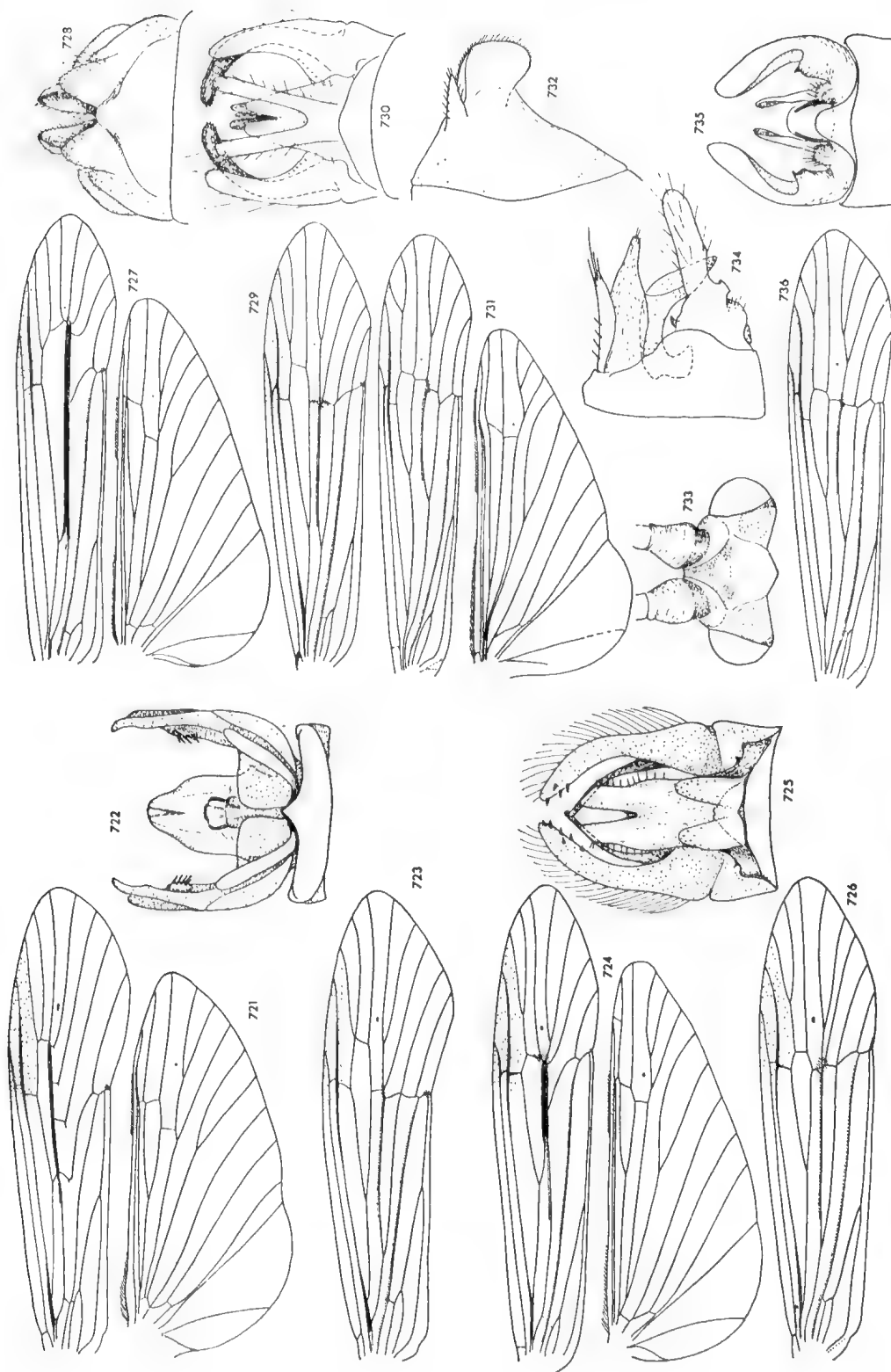
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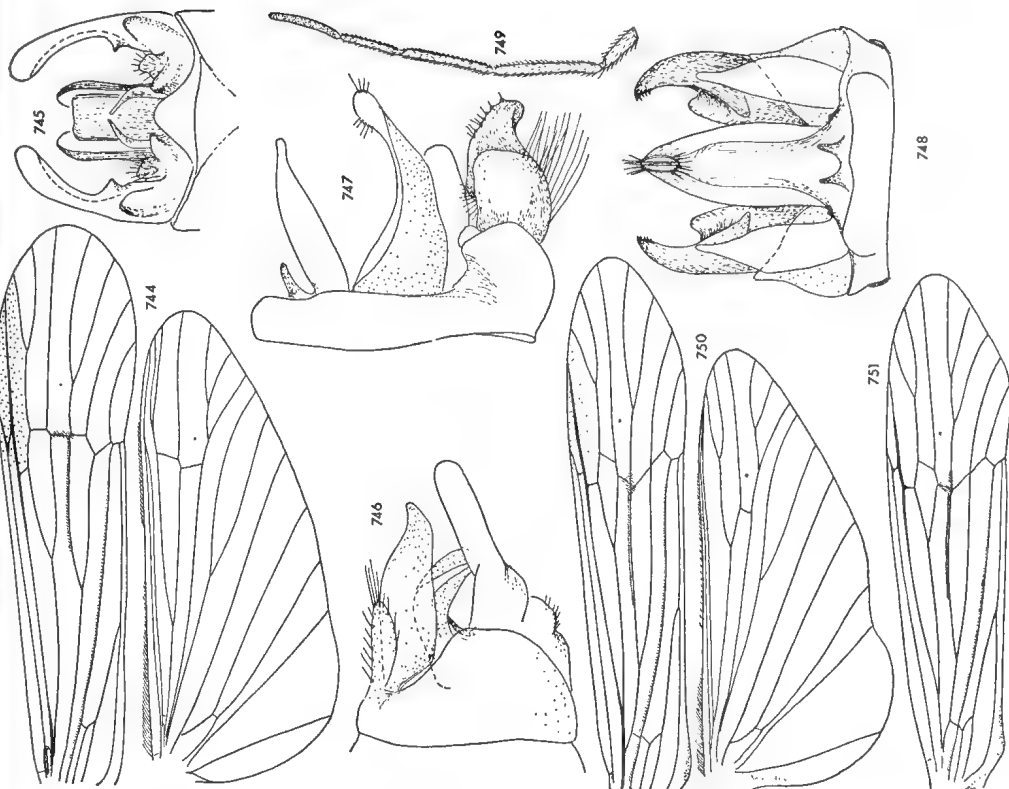


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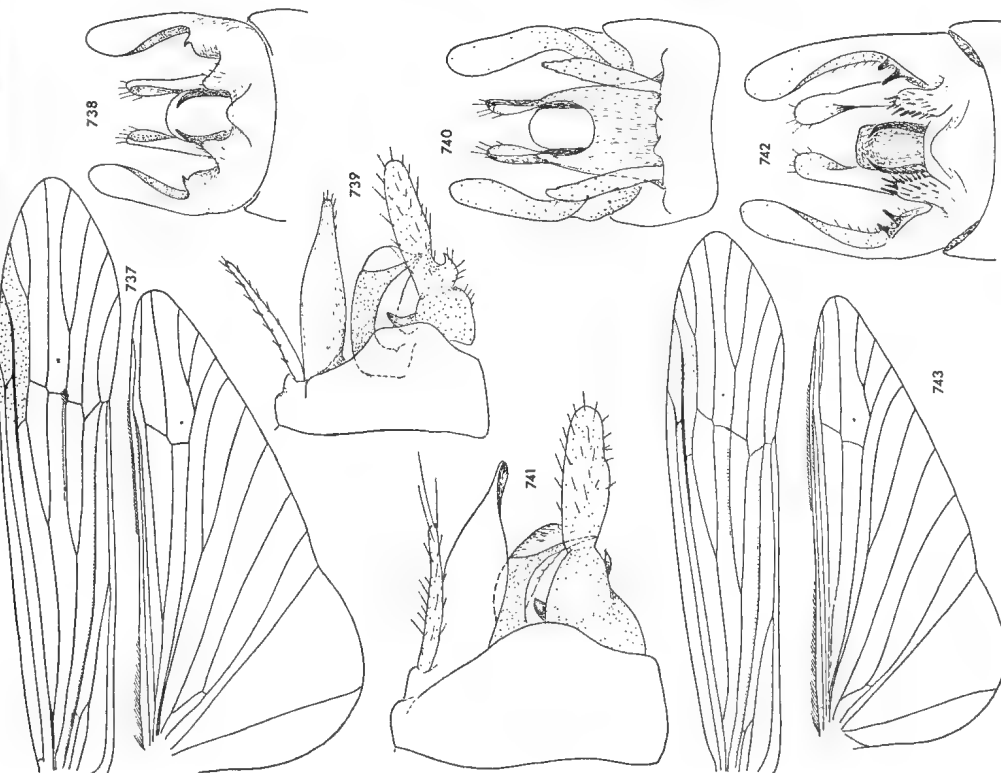
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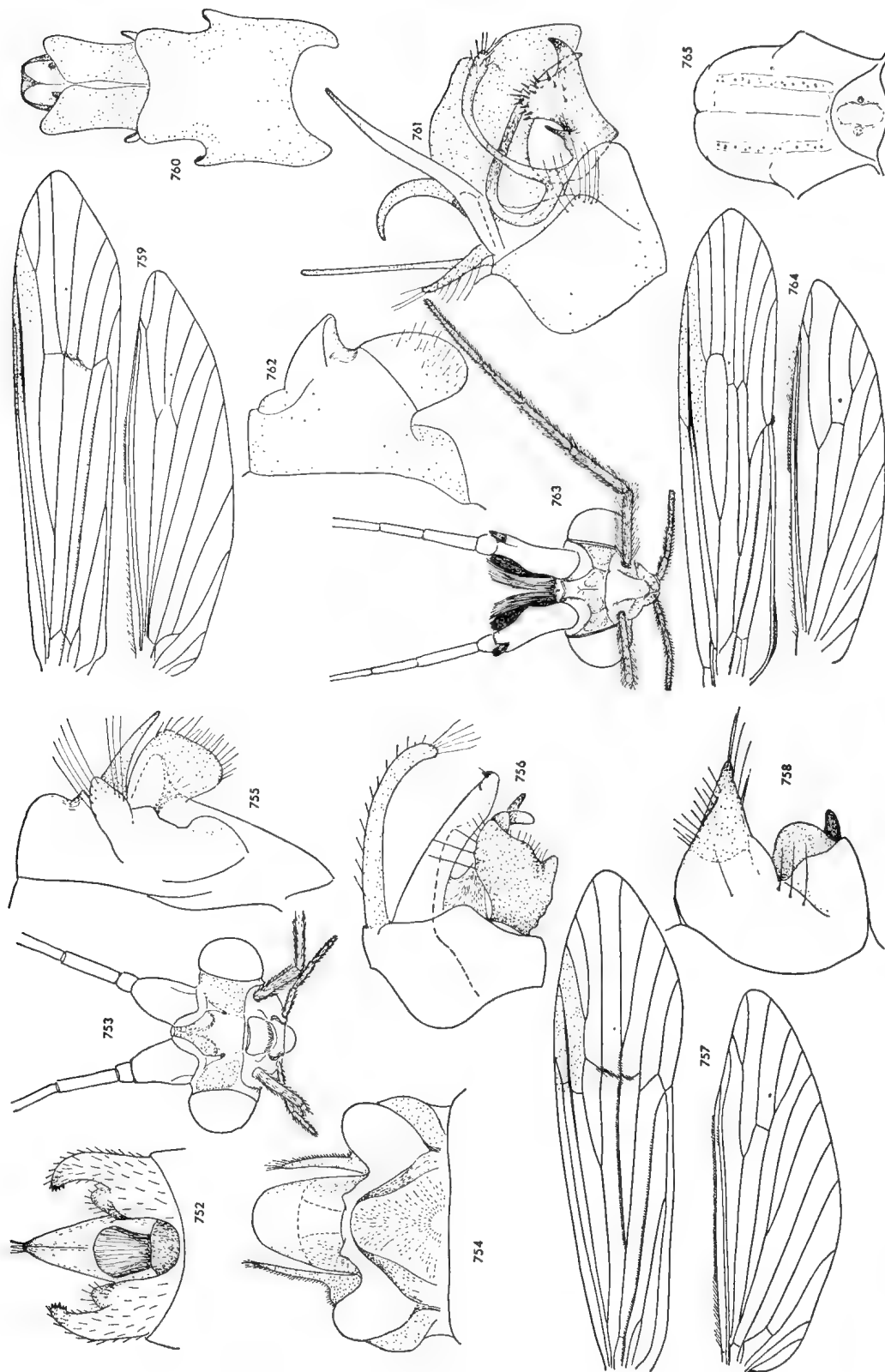


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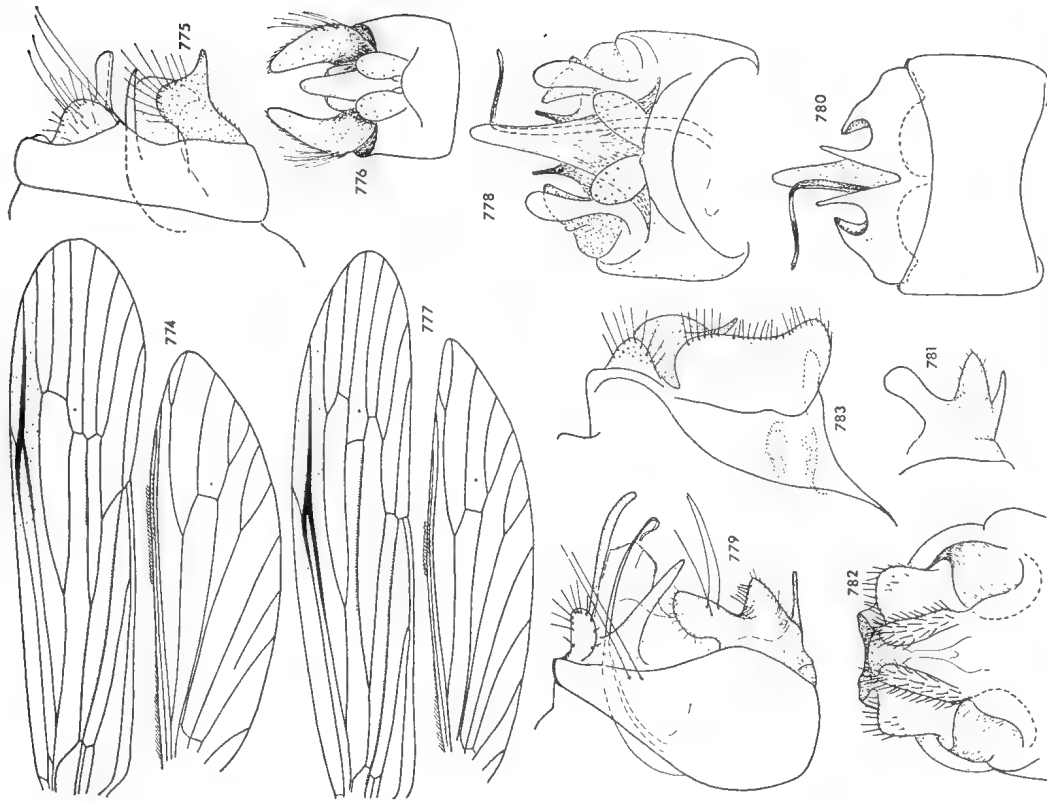


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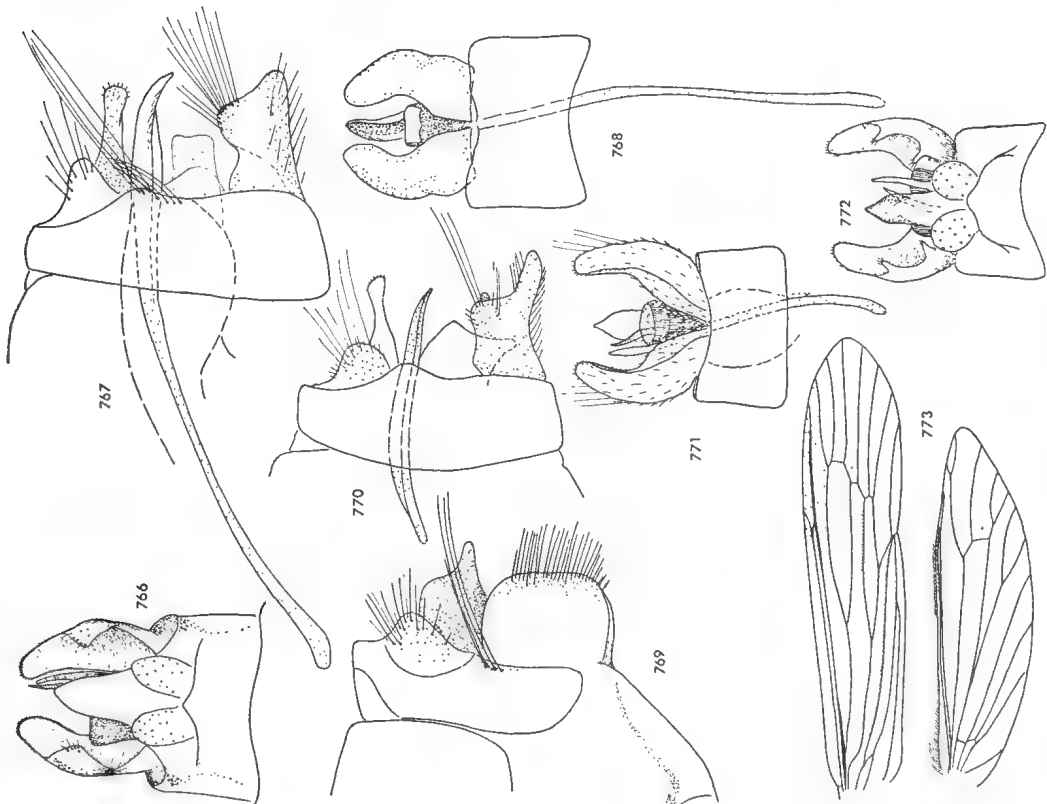
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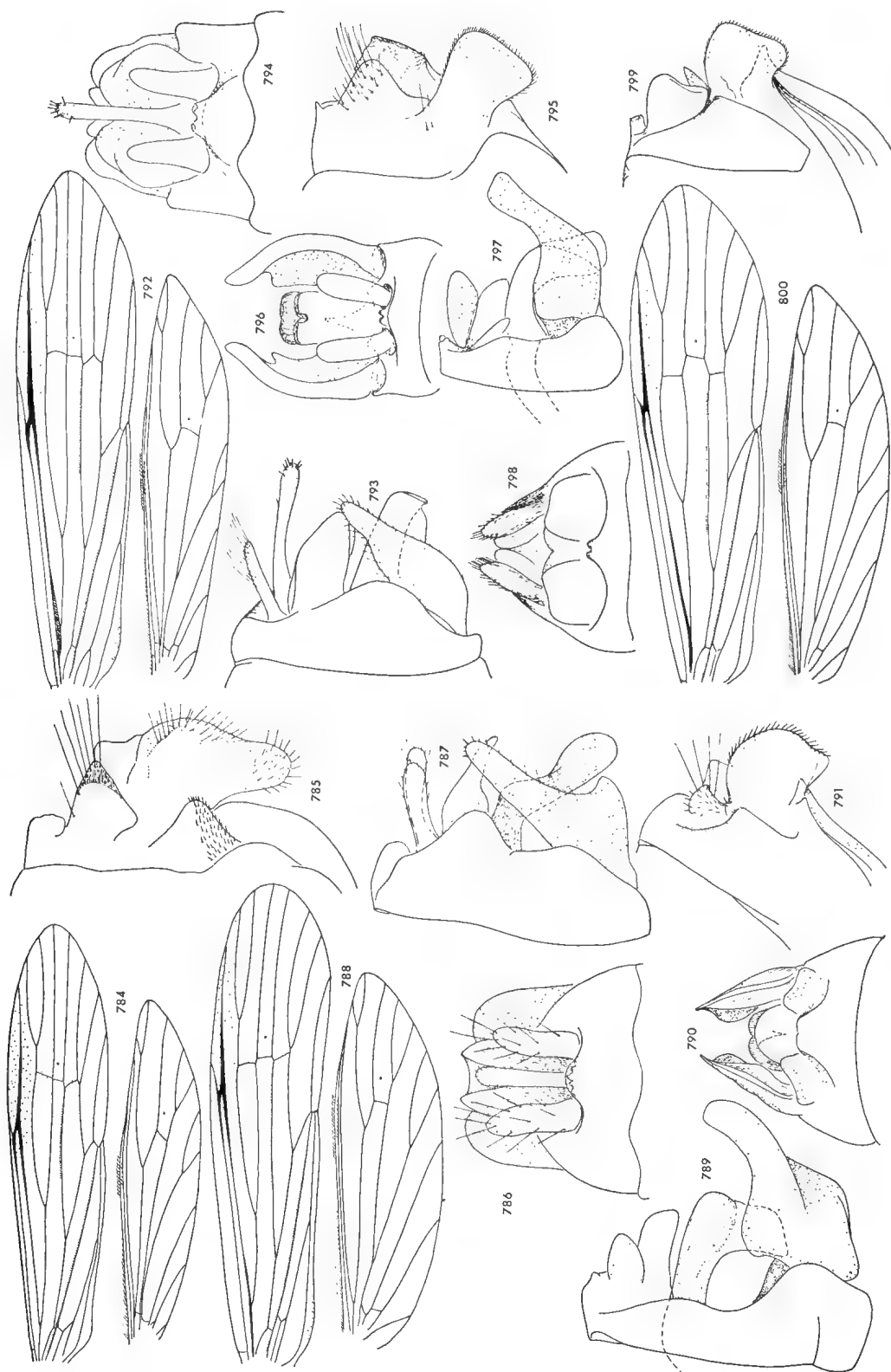
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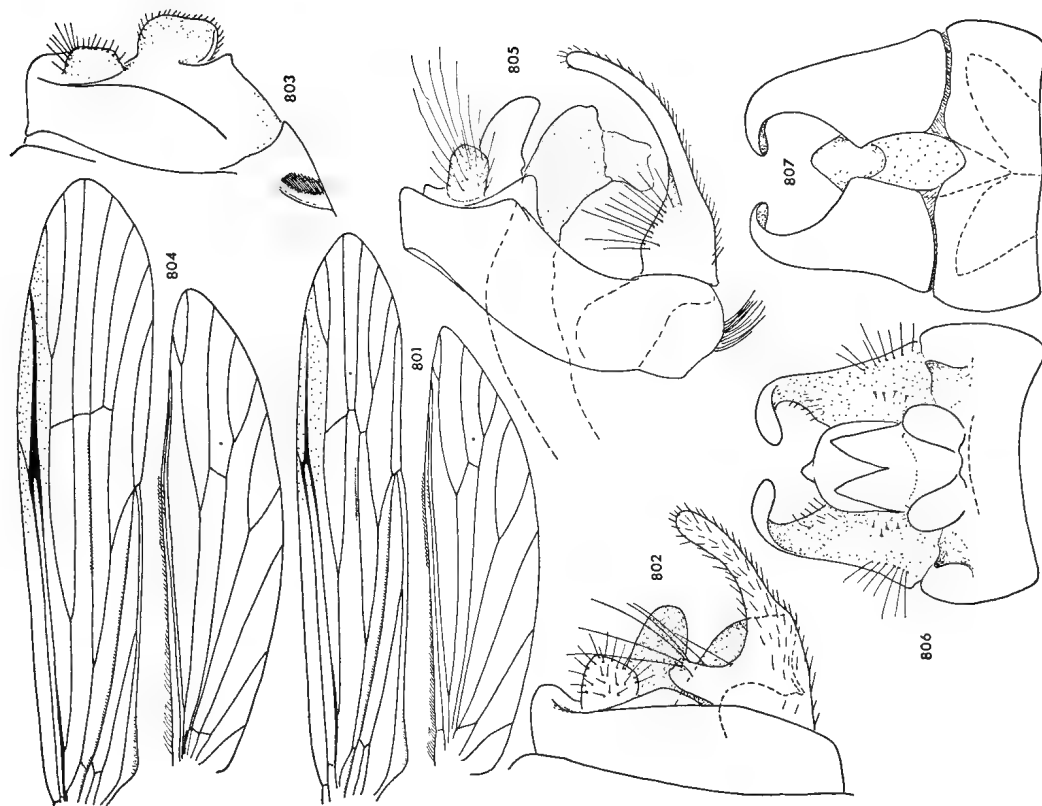


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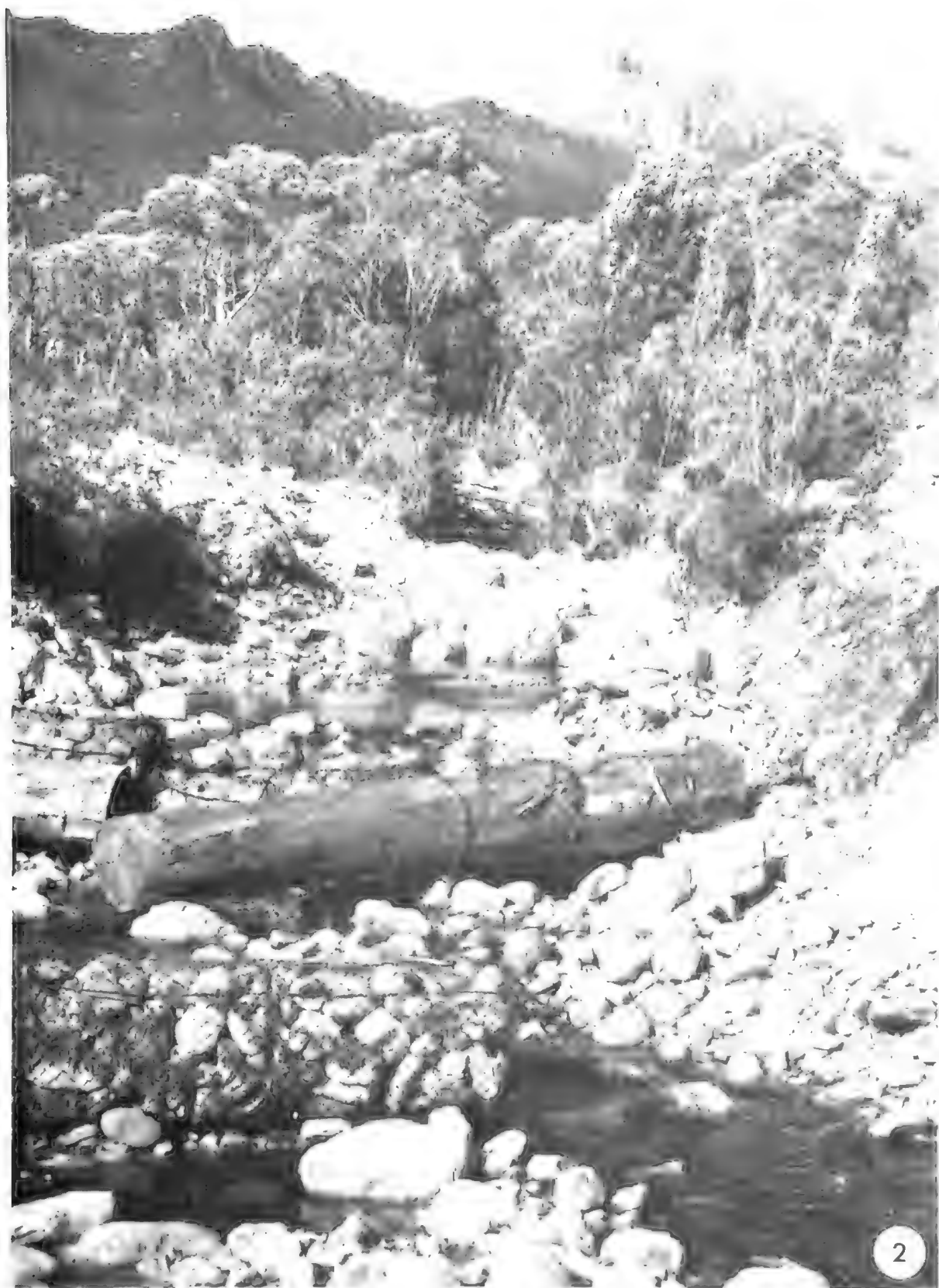
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### **Plates 1-3**

1. Huon Plains looking west from Mt. Eliza, showing Scotts Peak Dam access road, Condominion Creek crossing indicated by the widening in the road. Forested line across the plain indicates Huon River. Lake Pedder in the background.
2. Condominion Creek—in the foreground disturbed creek bed near the road.
3. Russell Falls, National Park.









# A REVISION OF THE GENUS *ANILICUS* CANDEZE, WITH NOTES ON RELATED GENERA (COLEOPTERA: ELATERIDAE)

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## Abstract

A taxonomic revision of the genus *Anilicus* Candèze is presented. Five species are included in the genus, two of which are new (*A. rectilineatus* and *A. parvus*), and four species are placed in other genera.

The genus *Augenotus* is established to accommodate *Anilicus quadriguttatus* (Erichson) and *Melanoxanthus australis* Candèze; one new species—*aurantius*— is described.

*Anilicus haemorrhoidalis* Candèze is transferred to the genus *Anilicoides* Candèze.

*Anilicus flavipennis* Candèze is synonymized with *Acroniopus rufipennis* (Macleay, W. J.) and *Anilicus nigroterminatus* (Macleay, W.S.) is synonymized with *Melanoxanthus melanocephalus* (Fabricius).

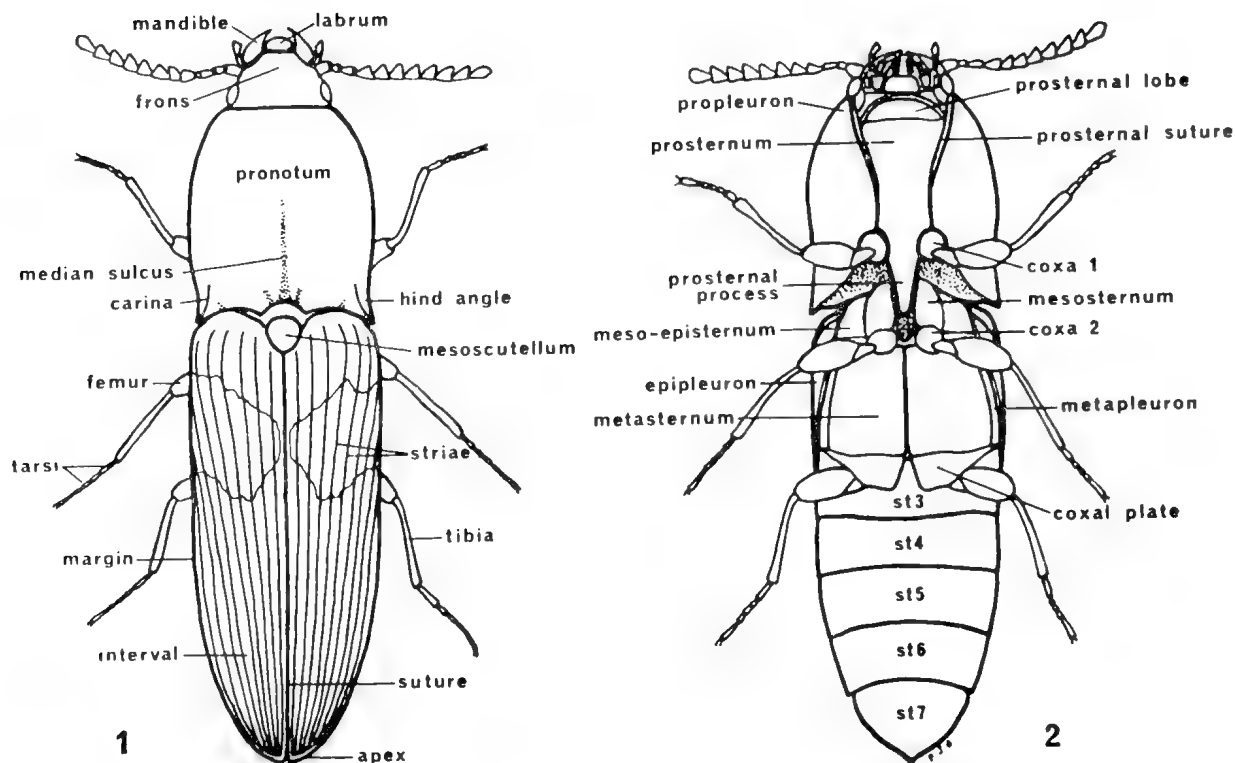
## Introduction

The genus *Anilicus* was erected by Candèze in 1863 to accommodate four Australian species: *A. attenuatus* Candèze, *A. loricatus* Candèze, *A. semiflavus* (Germar) and *A. quadriguttatus* (Erichson). Candèze (1878, 1889, 1891) subsequently added three more species: *A. flavipennis* Candèze, *A. nigroterminatus* (Macleay, W. S.) and *A. haemorrhoidalis* Candèze. Since the original descriptions were published, the genus has received only scanty mention in the literature (Froggatt, 1907; Goudie, 1923; Tillyard, 1926) and from study of available material it was evident that the species grouping was in need of revision.

Of the morphological characters employed in this study, particular attention was directed to the genitalia as these have been found to be especially useful for separation at the specific level in other Coleoptera, including the Elateridae (Sharp and Muir, 1912; Becker, 1956; Neboiss, 1957; Brooks, 1960), and there is an extensive literature on their structure and function (e.g. Snodgrass, 1935; Zacharuk, 1958; Crowson, 1967; Tuxen, 1970). The terminology associated with the genitalia has been adopted from Neboiss (1957), while Figures 1 and 2 illustrate other morphological features that will be discussed in the text.

Collections from which data were obtained or specimens examined are listed below, together with the abbreviations used in the text. Museums housing type specimens are also included in this list.

|        |   |
|--------|---|
| AM     | Australian Museum, Sydney   |
| ANIC   | Australian National Insect Collection, CSIRO, Canberra                |
| BM     | British Museum (Natural History), London                              |
| CALIF  | Californian Academy of Sciences, Golden Gate Park, San Francisco      |
| DGB    | Private collection of Mr D. G. Black, Melbourne                       |
| ETS    | Private collection of Mr E. T. Smith, Melbourne                       |
| FH     | Private collection of Mr F. Hallgarten, Melbourne                     |
| FTF    | Private collection of Mr F. T. Fricke, Sydney                         |
| GA     | Private collection of Mr G. Anderson, Yaaapeet, Vic.                  |
| HOWITT | Howitt collection, National Museum of Victoria, Melbourne             |
| IRSNB  | Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium |
| JB     | Private collection of Mr J. Balderston, Canberra                      |
| JGB    | Private collection of (late) Mr J. G. Brooks, Cairns                  |
| KBL    | Kamerunga Biological Laboratories, Cairns                             |
| MACL   | Macleay Museum, University of Sydney, Sydney                          |
| MCZ    | Museum of Comparative Zoology, Harvard University, Cambridge, Mass.   |



Figures 1-2—*Anilicus loricatus* Cand.—1, dorsal view; 2, ventral view.

|       |   |
|-------|---|
| MGF   | Museum G. Frey, Tutzing bei München, Germany        |
| MJF   | Private collection of Mr M. J. Fletcher, Sydney     |
| NMV   | National Museum of Victoria, Melbourne              |
| NSWDA | New South Wales Department of Agriculture, Sydney   |
| PARIS | Musée Nationale d'Histoire Naturelle, Paris, France |
| PM    | Private collection of Mr P. Meyer, Melbourne        |
| PW    | Private collection of Mr P. Williams, Melbourne     |
| QM    | Queensland Museum, Brisbane                         |
| QU    | Queensland University, Brisbane                     |
| SAM   | South Australian Museum, Adelaide                   |
| TDA   | Tasmanian Department of Agriculture, Hobart         |
| TM    | Tasmanian Museum, Hobart                            |

|      |   |
|------|---|
| UNE  | University of New England, Armidale, N.S.W.               |
| UT   | University of Tasmania, Hobart                            |
| WADA | Western Australian Department of Agriculture, Perth       |
| WAM  | Western Australian Museum, Perth                          |
| ZM   | Zoologisches Museum, Humboldt University, Berlin, Germany |

All data and descriptions were prepared from specimens belonging to the above institutions and collections, and although actual types (with two exceptions) were not seen, descriptions were produced with the aid of type comparisons made by Arturs Neboiss, Curator of Insects, National Museum of Victoria.

#### Genus *Anilicus* Candèze

*Anilicus* Candèze, 1863: 328; 1878: 192; 1889: 120; 1891: 192; Schwarz, 1907: 264; Neboiss, 1956: 57; 1961: 27.

Type species: *Anilicus attenuatus* Candèze (original designation).

Of the seven species placed in this genus by Candèze three are retained, and one of these, *A. semiflavus*, becomes *A. xanthomus* (Macleay, W. S.) since it was described under the name *Elater xanthomus* by W. S. Macleay prior to Germar's publication. Two new *Anilicus* species are described, bringing the total number of species in this genus to five. *Anilicus quadriguttatus* was found to be closely related to *Melanoxanthus australis*, a species whose characters are not those of the genus *Melanoxanthus*, and a new species, closely allied to the above two, is described. The genus *Augenotus* has been established to accommodate these three species. *Anilicus haemorrhoidalis* has been transferred to the genus *Anilicoides* due to its morphological similarity to *Anilicoides depressus* Candèze. Two species, *Anilicus nigroterminatus* and *Anilicus flavipennis* were found to be synonymous with *Melanoxanthus melanocephalus* and *Acroniopus rufipennis* respectively.

Members of the genus *Anilicus* are moderately small to medium sized, measuring 5 to 16 mm in length. All species exhibit a quite distinct bicolourous pattern on the elytra, of black and an orange or yellowish-brown. The head, prothorax and abdomen are black to brownish-black. Sexual dimorphism is apparent in some species, with the seventh abdominal sternite of the male being more cuspidate than that of the female. In some species body size reflects sexual differences.

Head small, inclined downward, punctate, covered with coarse, short pubescence; frons slightly convex with indistinct median depression, weakly raised antennary ridge on anterolateral margin, and straight anterior margin. Mandibles broad at base, curved, attenuate and cuspidate. Terminal segment of maxillary palps dolabriform, widest at distal end. Labrum only slightly wider than long. Antennae blackish, pubescent, of moderate length; 1st segment thickened, 2nd very short and rounded, 3rd elongate, 4th to 10th segments subequal and triangular, 11th (terminal) segment irregularly hexagonal.

Pronotum densely punctate, covered with coarse hairs; median sulcus distinct, extending

to, or almost to, the anterior margin; hind angles strongly carinate. Prosternal lobe arcuate anteriorly; prosternal groove for the reception of the antennae present at anterior end of suture; prosternal process with central ridge, flattening out posteriorly.

Mesoscutellum black, triangular, slightly convex, sloping towards the smooth margins, punctate and pubescent. Elytra elongate, depressed, punctate-striate, covered with short, coarse hairs, the intervals slightly convex, the apex divaricate and more or less acuminate depending upon the species.

Underside of body black to reddish-brown and pubescent. The 7th (last visible) abdominal sternite generally acuminate and mucronate. The shape of the 8th abdominal tergite of the female is of some use in separation of the species.

Legs pubescent, black to brownish-black; tibia bearing two ventral spines at distal end; tarsi simple, filiform, the segments gradually decreasing in length from the 1st to the 4th, with the 5th equal to, or longer than, the 1st; two equal claws.

Lateral lobes of aedeagus slender, of approximately equal width over entire length, two or three setae present on each apex, apical hooks absent. Median lobe slender; furca long and narrow. The shape of the apices of the lateral lobes, the relative lengths of the lateral and median lobes, and the shape of the basal piece are important characters for separation at the specific level. External genitalia of female similar in all species. Chitinous spines, which are useful for distinguishing species, are present at the entrance of the bursa copulatrix of the female in some species, absent in others.

Larvae are unknown.

#### KEY TO SPECIES OF *ANILICUS*

- 1—Some black at base of elytra; black extending from apex to more than half length of elytra ..... *A. loricatus* Cand.
- Basal region of elytra yellow ochre to burnt sienna colour; black generally extending less than half length of elytra ..... 2



- 2—Pronotum with narrow hind angle, length about three times width . . . . .

*A. rectilineatus* sp. nov.

- Pronotum with variable shaped hind angle, length less than three times width . . . . .

3

- 3—Total body length greater than 10 mm; elytra tapering almost rectilinearly from base to apex . . . . . *A. attenuatus* Cand.

- Body generally less than 10 mm in length, but if greater then with elytral margins almost parallel for 2/3rds of length . . . . .

4

- 4—Total body length from 6 mm to 12 mm; elytral margins almost parallel for 2/3rds of length; elytral base usually of a burnt sienna colour; lateral lobes of aedeagus of ♂ expanded apically; bursa copulatrix of ♀ without chitinous spines . . . . .

*A. xanthomus* (MacL., W. S.)

- Total body length less than 8 mm; ♂ ♂ smaller than ♀ ♀ and with very tapering elytra; elytral base generally of a yellow ochre colour; lateral lobes of aedeagus of ♂ tapering curvilinearly to apex; bursa copulatrix of ♀ with chitinous spines . . . . .

*A. parvus* sp. nov.

**Distribution:** Queensland, New South Wales, Victoria, southern South Australia and south-western Western Australia (Fig. 3).

**Plant associations:** *Anilicus* does not appear to have a specific host plant. Adults are probably nectar and pollen feeders, having been found in association with the following plants:

*A. attenuatus* Candèze: *Bursaria spinosa* Cav. (Fern-tree Gully, Vic.).

*A. loricatus* Candèze: *Nuystia floribunda* Brown (Wannamal, W.A.), *Xanthorrhoea* sp. (Denmark, W.A.).

*A. xanthomus* (Macleay, W. S.): *Angophora cordifolia* Cav. blossom (Ku-Ring-Gai Chase Nat. Park, N.S.W.), *Bursaria spinosa* Cav. flowers (Alligator Gorge, Flinders Ranges, S.A.; Banksia Park, Shannon Rise, S.A.; Dimboola, Vic.), *Callitris* sp. (Pinery, S.A.), *Eucalyptus* sp. blossom (Barron Falls, Kuranda, Q'ld), under bark of *Eucalyptus camaldulensis* Dehnh. (Kulkyne Forest, Vic.), *Kunzea* sp. (Endrick River, near Nerriga, N.S.W.), *Leptospermum* sp. (Cordeaux Reservoir, N.S.W.; Eildon Reservoir, Vic.; Nadgee Faunal Reserve, near Merrica

River, N.S.W.), *Leptospermum* sp. flowers (Glenbrook, Blue Mountains, N.S.W.; Narrabeen Plateau, N.S.W.), *Leptospermum juniperinum* Sm. (Mallacoota, Vic.), *Nuystia floribunda* Brown (Muccha, W.A.), *Prostanthera lasianthos* Labill. (Warburton, Vic.).

### ***Anilicus attenuatus* Candèze**

(Figures 4-5; Plate 4, figure 1)

*Anilicus attenuatus* Candèze, 1863: 330; Neboiss, 1956: 57.

Candèze described this species from several specimens found by M. Bakewell in the vicinity of Melbourne, Victoria. He considered it a distinctive member of *Anilicus* due to its greater stature, compared with other *Anilicus* species, the attenuation of the elytra and the arrangement of the yellow colour. The Latin trivial name *attenuatus* means 'tapered' and apparently refers to the elytra.

The basal half of the elytra is a yellow ochre to a burnt sienna colour; the apical half, the pronotum and the head are black. The black of the elytra forms a W-shape at its junction with the orange, the black extending anteriorly for a greater distance along the lateral margin than along the suture. Sexual dimorphism not apparent.

Antennae black, or black with a reddish-brown tinge, the outer margins of the 4th to 10th segments convex. Mandibles with one small incisor cusp on inner margin.

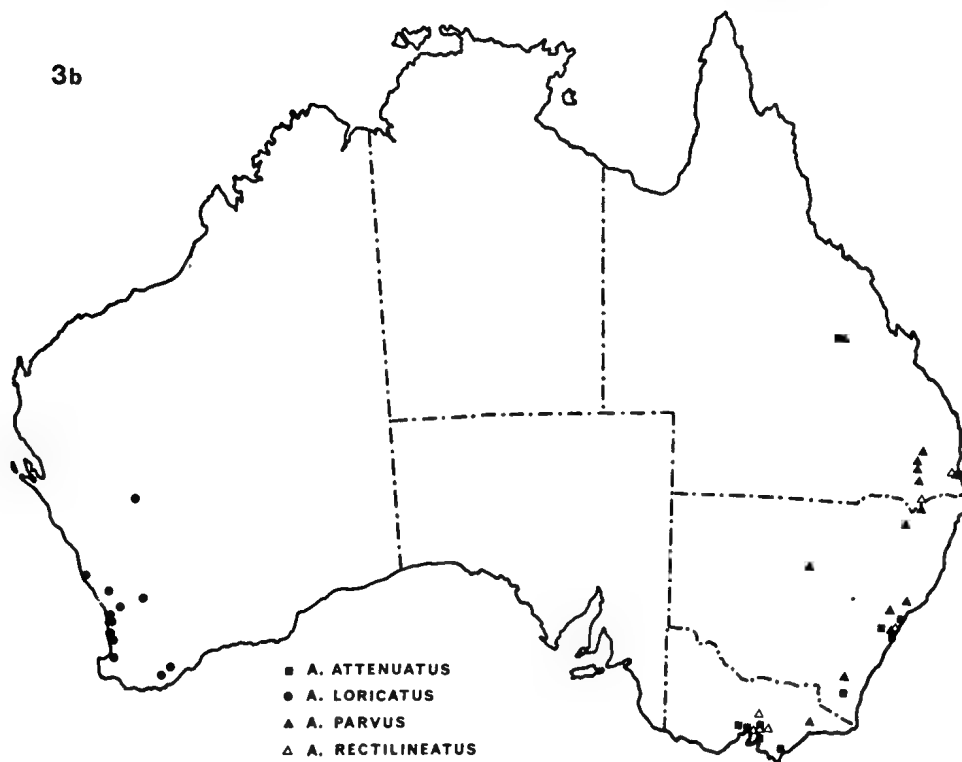
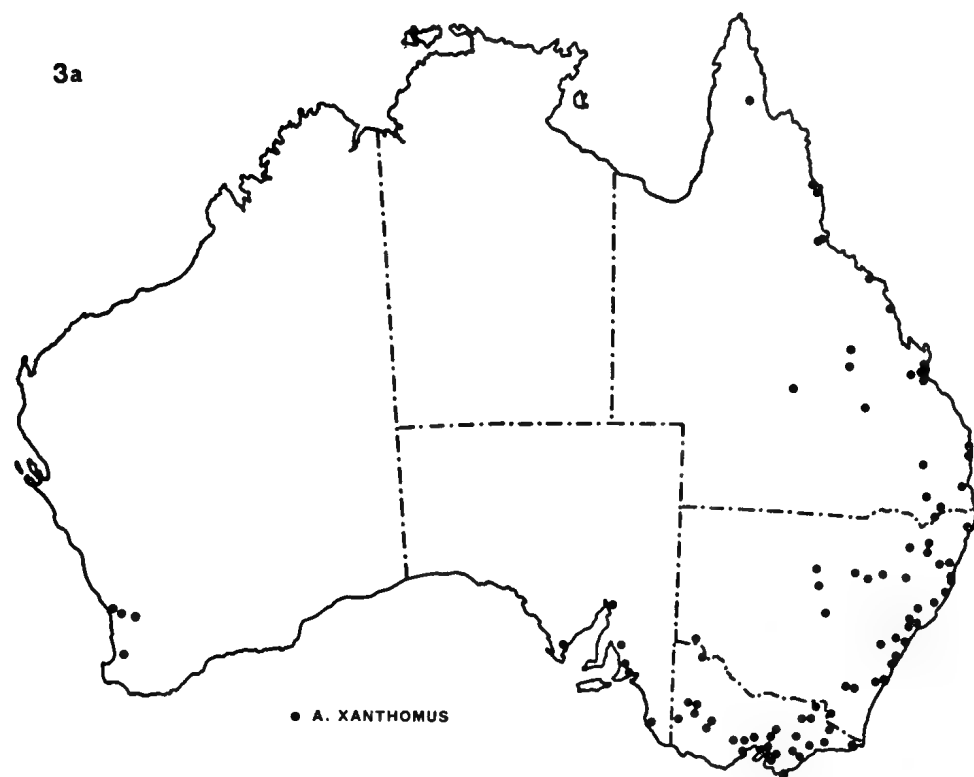
Pronotum slightly longer than wide (length and width measured medially), widest posteriorly, curvilinearly tapering anteriorly, convex; punctures small, separated by a distance equal to their diameters; median sulcus distinct throughout length of pronotum, more deeply furrowed posteriorly.

Mesoscutellum with narrow central ridge devoid of punctures. Elytra more than twice as long as the pronotum, basal width equal to pronotal width as measured across apices of hind angles, tapering almost rectilinearly from base to apex, divaricate and separately acuminate, with conspicuous striae.

Figure 3—Recorded distribution of the genus *Anilicus* in Australia.

a—distribution of *A. xanthomus*.

b—distribution of *A. attenuatus*, *A. loricatus*, *A. parvus* and *A. rectilineatus*.





Seventh abdominal sternite of both sexes extremely carinate and mucronate. Eighth abdominal tergite of female widest in basal half, tapering rectilinearly until near apex, curvilinearly to apex. Legs black, or black with a reddish-brown tinge, paler towards the extremities.

Lateral lobes of aedeagus narrowing slightly from base to near apex, curvilinearly tapering to apex; median lobe significantly shorter than lateral lobes; basal piece truncated proximally (Fig. 4). Chitinous spines absent from bursa copulatrix of female.

*Dimensions:* Length, 10.2-16.2 mm; width, 2.8-4.6 mm.

*Specimens examined:* 120. Sexes undetermined. AM, ANIC, CALIF, ETS, FH, JB, JGB, NSWDA, PW, QU, SAM.

*Type data:* Location—IRSNB; Locality—Melbourne, Victoria.

*Dimensions:* Length, 12-13 mm; width, 3.5 mm.

*Distribution:* Queensland—Clermont (near N.S.W.-Q'd border); New South Wales—Blue Mountains, Cowan (Dec.), Galston, Illawarra (Feb.), Kosciusko, Pennant Hills (Sydney suburb, Nov.); Victoria—Dandenong Ranges (Jan.), East Warburton (Mar.), Ferntree Gully (Feb.), Gippsland, Healesville (Jan.), Launching Place (Jan., Feb.), Melbourne, Millgrove (Jan.), Monbulk (Jan., Feb., Mar.), Mount Evelyn (Mar.), Nar Nar Goon (Feb., Mar.), Parwan (Feb.), Reefton (Jan.), South Wandin (Jan.), Walshs Creek nr. Warburton (Jan.), Warburton (Jan., Feb.), Yarram.

***Anilicus xanthomus* (Macleay, W. S.)**  
(Figures 6, 8-10; Plate 4, figures 2-3)

*Elater xanthomus* Macleay, W. S., 1827: 441; Neboiss, 1956: 36.

*Ampedus semiflavus* Germar, 1844: 163, syn. nov.

*Anilicus semiflavus*, Candèze, 1863: 329; Neboiss, 1956: 58; 1961: 27.

*Anilicus xanthomus*, Neboiss, 1961: 27.

The synonymy of *Elater xanthomus* Macleay, W. S. and *Anilicus semiflavus* (Germar) was based on a comparison of types made by A. Neboiss. In Germar's original description of *Ampedus semiflavus* no single specimen was designated as a holotype. Neboiss selected a

lectotype ( $\delta$  with printed number '43510') from two specimens in the Humboldt University, Berlin, the other having the same number in handwriting (probably  $\varphi$ ). Neboiss (1961) listed both *Anilicus xanthomus* (Macleay, W. S.) and *Anilicus semiflavus* (Germar) separately in the revision of the check list, but he was aware of their synonymy (Neboiss, pers. comm.).

This species is the most widely distributed member of the genus, being found in all states in which *Anilicus* occurs. It is the most generalized species, being of diverse size and exhibiting variation in the shape of the elytral marking. The sexes are dimorphic.

The basal half to two-thirds of the elytra is yellow ochre to burnt sienna, more frequently the latter; apical portion black, its anterior margin of varied shape. Pronotum and head black. The Latin name *semiflavus* is derived from the prefix *semi*—'half' and *flavus*—'yellow'; *xanthomus* is from the Greek *xanthos*—'shades of yellow'.

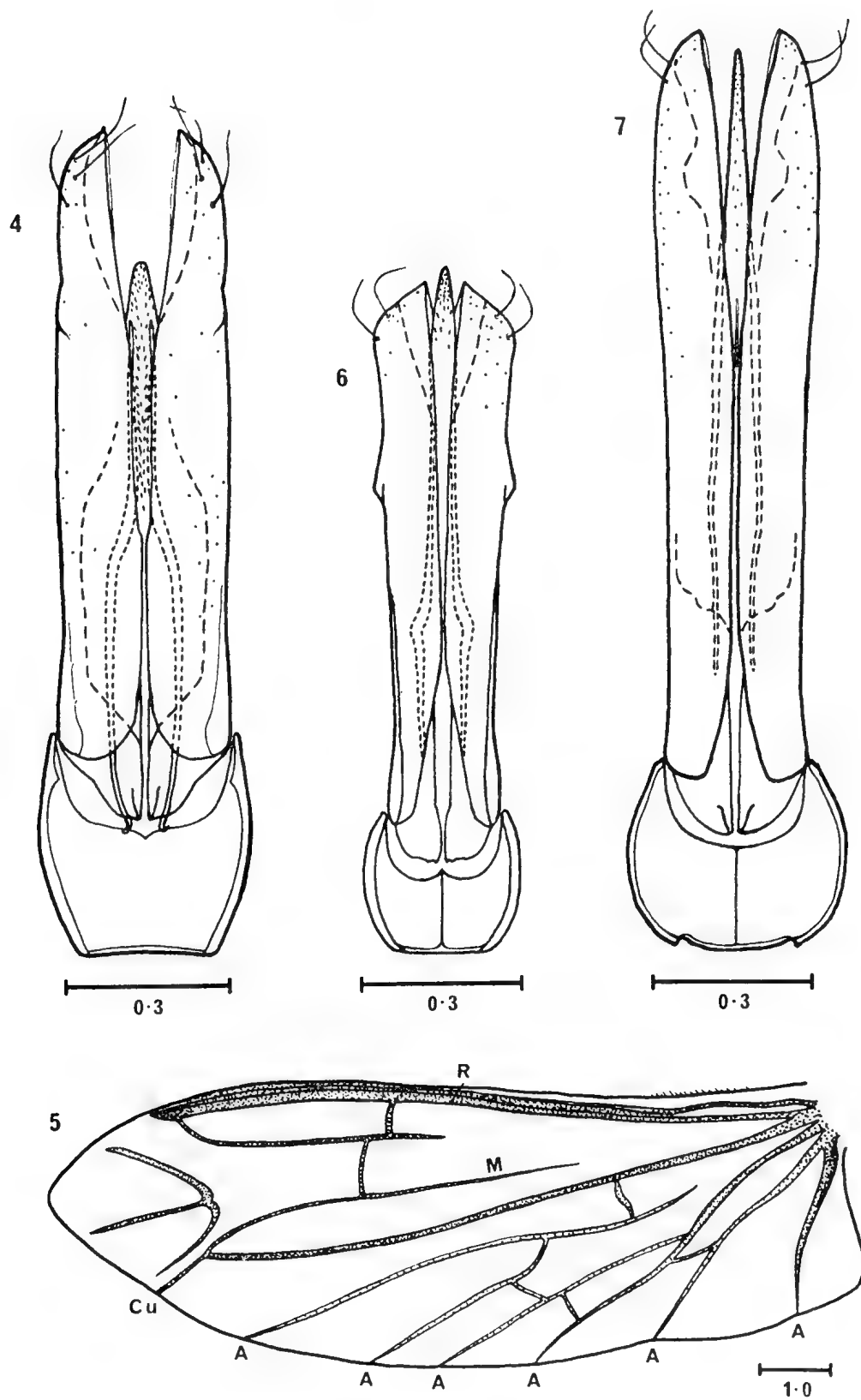
Antennae black, about same length as pronotum. Mandibles with indistinct, or no, incisor cusp on inner margin.

Pronotum about as long as wide (length and width measured medially), widest posteriorly across apices of carina, parallel-sided posteriolaterally, tapering curvilinearly anteriorly; punctures separated by a distance less than their diameters; median sulcus canaliculate; hind angles short, of varying width, carina divergent (Fig. 8).

Mesoscutellum convex, of varying shape, arcuate or indented on posterior margin. Elytra more than twice as long as pronotum, basal width equal to widest part of pronotum, almost parallel-sided for basal two-thirds of length, curvilinearly tapered to apex. Venation of hind wing similar to that of *A. attenuatus* (Fig. 5) and other *Anilicus* species.

Seventh abdominal sternite sexually dimorphic, apex more carinate and mucronate

Figures 4-7—5-7—*Anilicus attenuatus* Cand.—4—  
aedeagus; 5—wing venation; *Ani-*  
*licus xanthomus* (Macleay, W. S.)  
—6—aedeagus; *Anilicus loricatus*  
Cand.—7—aedeagus.



in males than in females. Eighth abdominal tergite of female widest near middle, tapering rectilinearly until near apex, then converging more sharply to apex. Legs dark reddish-brown, paler towards the extremities.

Lateral lobes of aedeagus expanded at apical end, with slight bulge on lateral margin near apex; median lobe just longer than lateral lobes; basal piece truncated proximally (Fig. 6). Chitinous spines absent from bursa copulatrix of female.

*Dimensions:* Length, ♂ 6.4–10.9 mm, ♀ 6.3–12.3 mm; width, ♂ 1.8–3.0 mm, ♀ 1.8–3.4 mm.

*Specimens examined:* 486: AM, ANIC, CALIF, DGB, ETS, FH, FTF, GA, JB, JGB, KBL, MCZ, MGF, MJF, NMV, NSWDA, PM, QM, QU, SAM, TM, UNE, WADA, WAM.

*Type data:* Holotype *Elater xanthomus* Macleay, W. S., ♀ (length—9.2 mm); Location—MACL (now deposited ANIC); Locality—New Holland, collected by Captain King, R.N., labelled '*Elater xanthomus* McL. New Holland, King'. (Type seen.)

Lectotype *Ampedus semiflavus* Germar, ♂ (with printed number '43510'); Location—ZM; Locality—Sydney, Novae Hollandiae.

*Distribution:* Throughout central and coastal Queensland, central and coastal New South Wales, Victoria, southern South Australia and south-western Western Australia.

*Phenotypic variation in relation to distribution:* The shape of the black at the elytral apex can be partitioned into two main forms, with only a small degree of overlap between the two. These may be termed the inverted-V form (Fig. 9) and the W form (Fig. 10). A count was made of the number of specimens in each state or territory that exhibited each elytral pattern (Table 1). From Table 1 it can be seen that the distribution of the two elytral forms varied between the states. The inverted-V form was more prevalent among specimens from Queensland, Victoria and South Australia, whereas specimens collected in New South Wales displayed the reverse trend.

The biological significance of these recorded trends in elytral marking is unknown. It is probably associated with environmental condi-

tions in certain regions within states, and may exist as a pleiotropic effect, varying coincidentally with some other genetic characteristic. Furthermore, it is probable that the bicolourous elytra possessed by all members of *Anilicus* have an adaptive function since this exact colour combination is found in species of several other genera of Elateridae (e.g. *Augenotus* and *Melanoxanthus*).

TABLE 1

Variation of Elytral Pattern in  
*Anilicus xanthomus*  
in Relation to Distribution

|        | Number of specimens<br>exhibiting inverted-<br>V elytral form | Number of specimens<br>exhibiting W elytral<br>form |
|--------|---|---|
| Q'ld   | 89  | 2   |
| N.S.W. | 65  | 118   |
| A.C.T. | 9   | 2   |
| Vic.   | 117   | 53  |
| S.A.   | 25  | 0   |
| W.A.   | 3   | 3   |
| Total  | 308   | 178   |

#### *Anilicus loricatus* Candèze

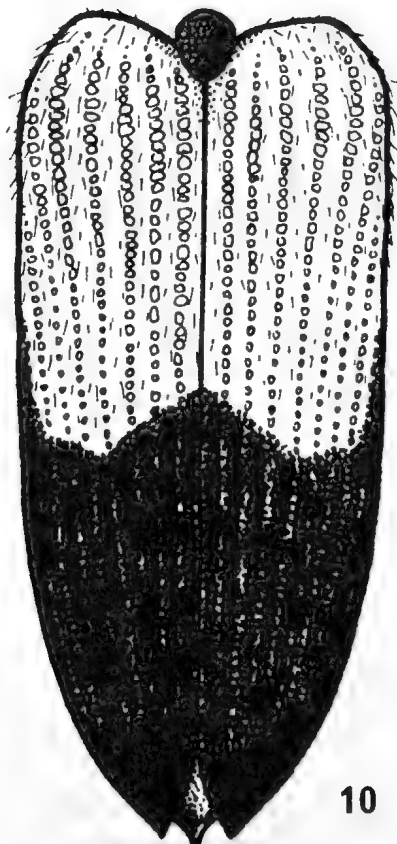
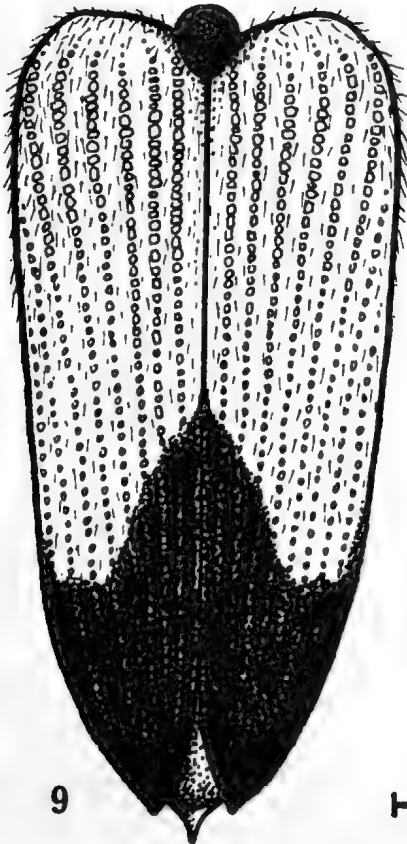
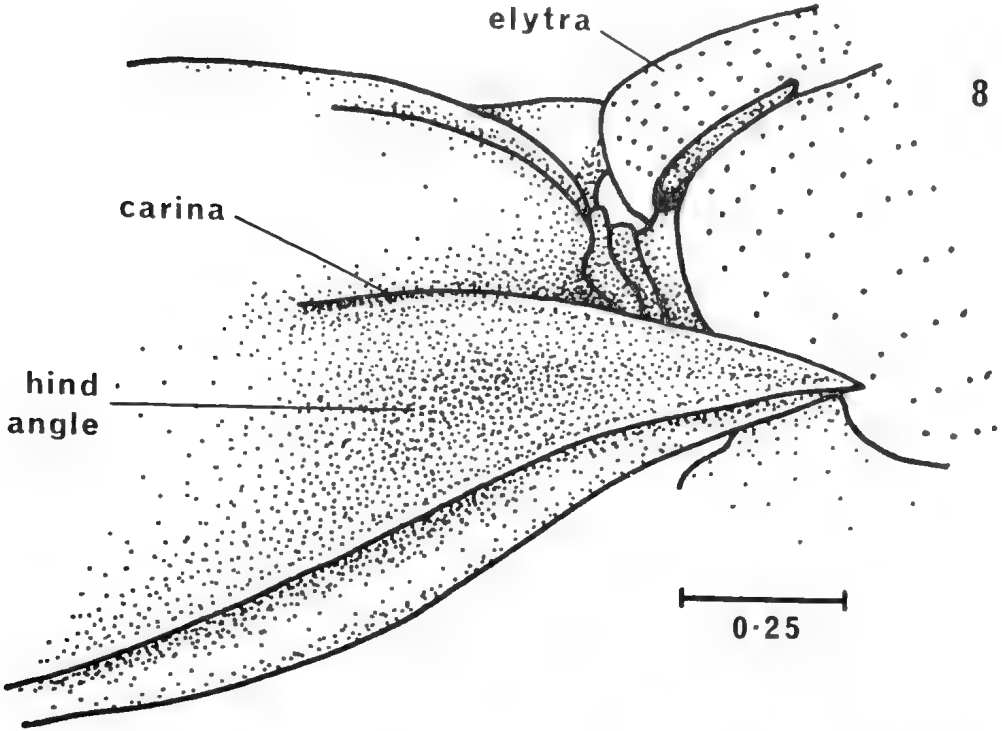
(Figure 7; Plate 4, figures 4–6)

*Anilicus loricatus* Candèze, 1863: 331; Neboiss, 1956: 58.

The colouration of this Western Australian species is distinctive. Black, or reddish-black, extends from the apex to more than half the length of the elytra; a narrow black, or reddish-black, region stretches across the elytral base, and the two are separated completely by a band of yellow ochre or burnt sienna, with its greatest length along the 4th or 5th striae from the suture; elytra entirely covered by black to reddish-black pubescence. The Latin trivial name *loricatus* means 'clad in mail'. Sexual dimorphism present.

Antennae black, or black with a reddish tinge, shorter than pronotum in both sexes (pronotum measured medially), segments

Figures 8–10—*Anilicus xanthomus* (Macleay, W. S.)—8, lateral view of pronotum depicting hind angle; 9, inverted-V form of elytral marking (♂ from Mangrove Mt. Rd., Calga, N.S.W., JB); 10, W form of elytral marking (♂ from Kiata, Vic., NMV).



robust, the outer margins of the 4th to 10th segments convex.

Pronotum slightly longer than wide (length and width measured medially), with punctures separated by a distance less than their diameters and with short, coarse pubescence; median sulcus indistinct anteriorly; hind angles short, strongly divergent.

Mesoscutellum flattened, level with the elytra, elongate. Elytra parallel-sided for two-thirds of length, curvilinearly tapered towards apex, hardly divaricate.

Seventh abdominal sternite of male carinate and mucronate, that of female rounded or only weakly carinate and mucronate. Eighth abdominal tergite of female widest on basal side of middle, rectilinearly tapering to apex. Legs of a deep burnt sienna to deep ochre colour, paler towards the extremities.

Lateral lobes of aedeagus diverging slightly towards the apex, curvilinearly tapered close to the apex; median lobe long and slender, slightly shorter than lateral lobes; basal piece wider than long, rounded proximally (Fig. 7). Chitinous spines absent from bursa copulatrix of female.

*Dimensions:* Length, ♂ 8.4–11.0 mm, ♀ 8.0–11.0 mm; width, ♂ 2.3–3.0 mm, ♀ 2.2–3.1 mm.

*Specimens examined:* 40. AM, ANIC, ETS, JGB, MACL, MF, NMV, SAM, WADA, WAM.

*Type data:* Holotype (length—10 mm, width—2.5 mm); Location—BM; Locality—Swan River, W.A.

*Distribution:* South-western Western Australia—Beverley, Bullsbrook (Nov.), Bunbury (Jan.), Capel District (Jan.), Darlington, Denmark (Jan.), Dunsborough, Fremantle (Aug.), Glen Forrest, Hamel, Jurien Bay (Dec.), King George's Sound, King's Nat. Park (Nov.), Lake Austin, Mount Barker, Mundaring (Oct.), Naval Base (Dec.), Pinjarra, Rockingham (April), Stirling Ranges (Dec.), Swan River, Tammin, Wannamal—6.5 km west of (Dec.).

*Ectoparasites:* Of the 40 specimens of *A. loricatus* examined, 25 were carrying ectoparasitic

mites of the suborder Mesostigmata. Two types of mesostigmatid were present—one measuring approximately 0.6 mm in length, the other 0.3 mm in length. The larger form was found on only two specimens whereas the smaller occurred on 25 specimens, including the two parasitized by the larger mite. These may represent the adult and nymphal stage of one species, or two distinct species. Both belong to the superfamily Uropodoidea, family Uropodidae, which contains 15 known genera (Tragardh, 1844; Baker and Wharton, 1952).

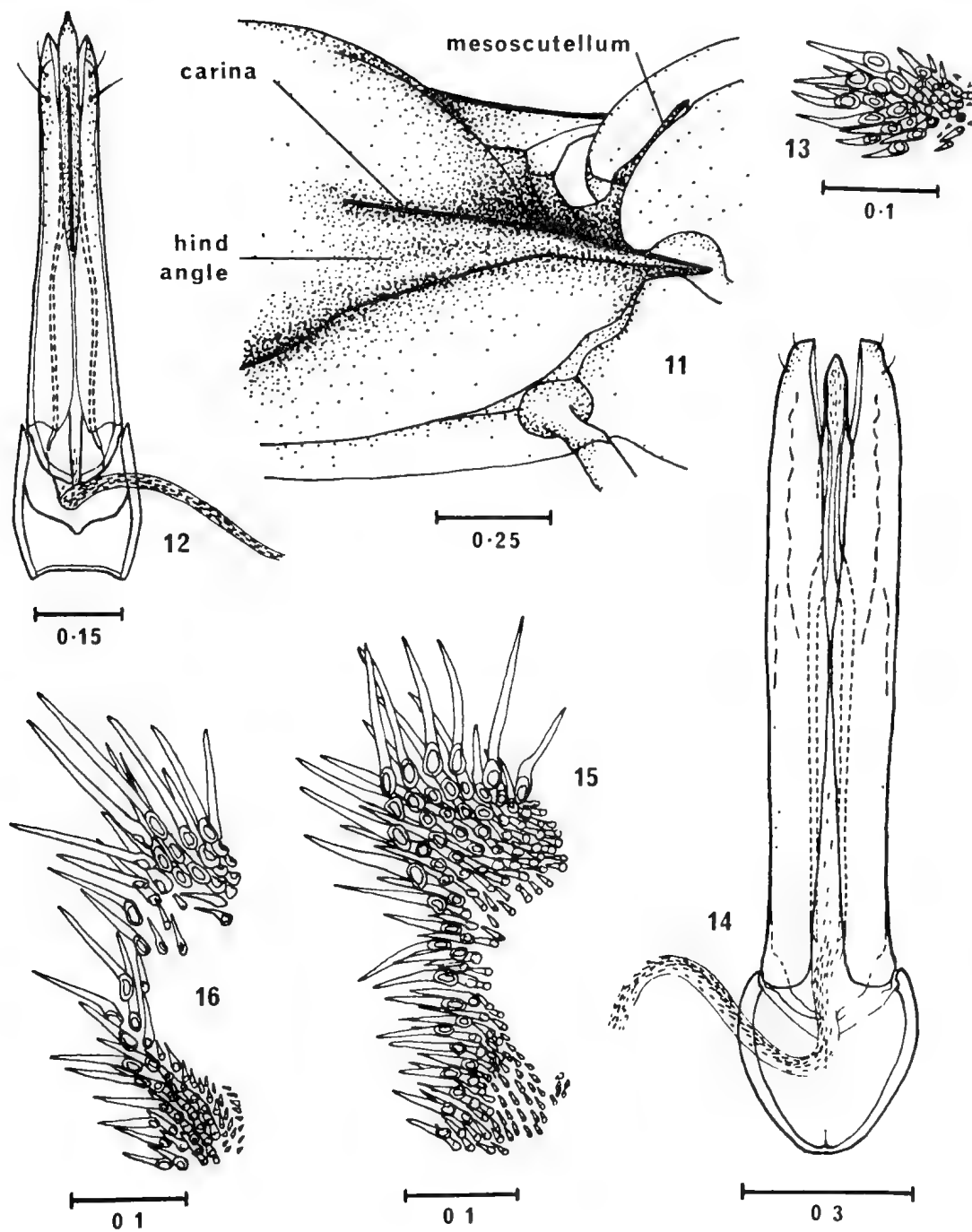
The larger mite was found on the dorsal surface of *A. loricatus* (Pl. 4, fig. 5), whereas the smaller one appeared to be confined to the ventral surface, particularly that of the prothorax (Pl. 4, fig. 6). Baker and Wharton (1952) state that the uropodids are of world-wide distribution, frequently attaching themselves to insects, especially in the nymphal stages. Their hosts are probably not harmed.

### *Anilicus rectilineatus* sp. nov.

(Figures 11–13; Plate 5, figures 7–8)

This is an uncommon species. It exhibits marked sexual dimorphism, notably a size difference (females being larger than males). Entirely black except for the basal half of the elytra, which is a yellow ochre colour. The trivial name is derived from the Latin *rectus*—‘straight’ and *lineatus*—‘of a line’, and refers to the straight line formed by the junction of the yellow ochre with the black on the elytra. At this junction the two colours merge into each other to produce a line of ferruginous colour. The body is entirely covered with a pubescence of the same hue as the ground colour.

Figures 11–13—14–16—*Anilicus rectilineatus*, sp. nov.—11, lateral view of pronotum depicting hind angle; 12, aedeagus; 13, chitinous spines of ♀ bursa copulatrix; 14–16, *Anilicus parvus*, sp. nov.—14, aedeagus of ‘type’ form; 15, chitinous spines of ♀ bursa copulatrix, inland or ‘type’ form; 16, chitinous spines of ♀ bursa copulatrix, coastal form.



Antennae black, with 4th to 10th segments long, slender and triangular in the male, slightly more rounded in the female.

Pronotum only slightly longer than wide (length and width measured medially), quite convex, with punctures separated by a distance less than their diameters; median sulcus indistinct anteriorly; posterior of pronotum with carina close to lateral margin, hence hind angle very narrow (Fig. 11).

Mesoscutellum triangular, flattened, narrow, with the posterior two-thirds tapering rectilinearly to the apex. Elytra tapering curvilinearly to apex, basal width equal to greatest width of pronotum, apex hardly divaricate.

Seventh abdominal sternite rounded in the female, slightly mucronate and carinate in the male. Eighth abdominal tergite of female widest at middle, tapering concavely between middle and apex. Legs of a dark brownish colour, paler towards the extremities.

Lateral and median lobes of aedeagus very slender and acuminate; median lobe longer than lateral lobes; basal piece truncated proximally, internal margin with a V-shaped depression (Fig. 12). Entrance of bursa copulatrix of female possessing a small, oval area of short, hollow, inwardly-directed, chitinous spines (Fig. 13). The function of such sclerotization is uncertain; it may serve to hold the male ejaculatory duct in position during copulation (Becker, 1956), or assist in the retention of the spermatophore after its deposition.

**Dimensions:** Length, ♂ 5.8-7.1 mm, ♀ 7.8-8.6 mm; width, ♂ 1.7-2.1 mm, ♀ 2.3-2.6 mm.

**Specimens examined:** 8 ♂, 5 ♀. AM, NMV, QM, QU, SAM.

**Type material:** Holotype ♂ Woori Yallock, Victoria. F. E. Wilson (NMV: T-4580); allotype ♀ Sydney, New South Wales. Lea. Elston Collection (AM); paratypes—♂ Caulfield, Victoria, 17 Jan. 1918. F. E. Wilson (NMV: T-4581); ♂ Sydney, New South Wales. Lea (SAM); ♀ Stanthorpe, Queensland, E. Sutton Collection, donated Dec. 1964 (QM: T-7231).

**Distribution:** Reported only from Alexandra

(April), Caulfield (Jan.), East Warburton (Mar.) and Woori Yallock in Victoria, from Sydney in New South Wales, and from Brisbane and Stanthorpe in Queensland.

Although only three specimens are accompanied by a recorded date of collection it is significant that two of these are from early autumn, since out of 208 specimens of *A. xanthomus* which have dates recorded on the label only one was caught in autumn (Brisbane, Queensland, 12 Mar., F. E. Wilson).

### ***Anilicus parvus* sp. nov.**

(Figures 14-16; Plate 5, figures 9-10)

This species is the smallest in the genus and hence was named *parvus* ('little'). Sexual dimorphism is apparent; males are smaller than females.

Entirely black, or black with a reddish-brown tinge, except for the basal half to two-thirds of the elytra which is yellow ochre. The two elytral colours merge together for a short distance to form a ferruginous hue. The body is covered with a pubescence of the same hue as the ground colour, except that black hairs frequently occur on the yellow near the apical black marking.

Antennae black, with 4th to 10th segments robust, the outer margin of each segment convex, segments more closely spaced in females than in males.

Pronotum of equal length and width (length and width measured medially), more depressed in males than in females; punctate, with punctures separated by a distance equal to their own diameters; median sulcus indistinct anteriorly; hind angle with carina diverging, angle broad and short.

Mesoscutellum generally black with a reddish-brown hue, convex, the margins raised above elytral surface, the corners rounded. Elytra tapering smoothly to apex, more curvilinearly in females than in males, basal width equal to greatest width of pronotum, apex hardly divaricate.

Sexual dimorphism of seventh sternite not apparent. Eighth abdominal tergite of female widest in basal half, tapering more or less curvi-

linearly to apex. Legs sienna brown, paler towards the extremities.

Lateral lobes of aedeagus of nearly equal width over entire length, curvilinearly tapered close to apex; median lobe shorter than lateral lobes; basal piece rounded at proximal end (Fig. 14). Female possessing an irregular crescent-shaped area of hollow chitinous spines at entrance of bursa copulatrix (Figs. 15 and 16).

*Phenotypic variation:* This species appears to exhibit geographic variation. Two forms can be distinguished—one is characterized by a pronounced blackish inverted-V at the elytral apex (Pl. 5, fig. 9) and by more numerous chitinous spines covering a larger area of the entrance to the bursa copulatrix of the female (Fig. 15); the second form has the black marking terminating in a nearly straight line at its junction with the yellow ochre of the elytra (Pl. 5, fig. 10) illustrates an extreme variant of this character) and the bursa copulatrix of the female has fewer chitinous spines (Fig. 16).

The intraspecific variation appears to coincide with an inland or mountainous (inverted-V form of elytral marking, more numerous spines on ♀ bursa copulatrix) as opposed to a coastal, habitat. North-south variation may also be involved as two specimens from A.C.T. and one from Victoria are all of the second form, as are specimens from the vicinity of Sydney and Brisbane.

The inadequate sample size prevents any definite conclusions being drawn concerning the relationship between this phenotypic variability and the distribution of the species. There is a scarcity of small specimens of *Anilicus* in loan collections.

*Dimensions:* Length, ♂ 5.3–6.8 mm, ♀ 6.7–7.9 mm; width, ♂ 1.5–2.0 mm, ♀ 2.0–2.2 mm.

*Specimens examined:* 22 ♂, 6 ♀. AM, ANIC, CALIF, JA, MACL, MCZ, NMV, QM, QU, SAM.

*Type material:* Holotype ♂ Jandowae, Queensland, Dec. 1926. Mr Hobler (NMV: T-4582); allotype ♀ Jandowae, Queensland, Dec. 1926. Mr Hobler (NMV: T-4583); paratype ♂

Bogan River, New South Wales. J. Armstrong (NMV: T-4584).

Coastal form not selected as paratypes since these two forms may prove to be sibling species — ♂ Hunter River, New South Wales (NMV); ♀ Maitland, New South Wales, 19 Nov. 1951 (NMV); ♀ Hornsby, New South Wales (AM).

*Distribution:* Queensland—Brisbane (Feb.), Clermont (Jan.), Dalby, Bunya Mountains (Jan.), Jandowae (Dec.), Millmerran (Dec.). New South Wales—Bogan River, Hornsby (Nov.), Hunter River, Maitland (Nov.), Reedy Creek (near Inverell, Nov.), Wilson's Downfall (Nov.). Australian Capital Territory—Black Mountain (Jan.). Victoria—Tambo Crossing (Jan.).

#### Genus *Augenotus* gen. nov.

(Figures 17–22)

*Type species:* *Melanoxanthus quadriguttatus* Erichson (present designation).

Species of medium size, measuring 8.0 mm to 13.6 mm in length, elongate and bicoloured. Sexual dimorphism present. Females generally larger and more robust than males.

Head black to blackish-ferruginous, approximately square in shape; frons moderately punctate, covered with a brownish pubescence, anterior margin tapering to a rounded point. Mandibles bidentate. Terminal segment of maxillary palps dolabriform. Labrum wider than long. Antennae black, of moderate length, as long as the pronotum in females, longer in males; 1st segment thickened, 2nd very short, rounded and longer in females than in males, 3rd slightly longer and more triangular than second, 4th to 10th segments flattened, triangular and subequal, 11th (terminal) segment elongate.

Prothorax longer than wide (length and width measured medially), appreciably narrowed anteriorly in males, almost parallel-sided in females, subconvex, more depressed in males (Fig. 17) than in females, nitid, sparsely punctate and covered with a fine pubescence; median sulcus indistinct; hind angles narrow, with carina hardly divergent in



females, more so in males. Prosternal lobe almost straight anteriorly, antennal grooves absent; lateroposteriorly directed projection present on posterior margin of propleuron; prosternal process laterally compressed on ventral side, widened dorsally.

Mesoscutellum elongate, flattened, widest points at base and middle, broader in females than in males. Elytra more than twice as long as prothorax, as wide as widest part of prothorax, parallel-sided as far as the middle, curvilinearly tapered to the apex, the latter rounded. Elytral surface nitid, striae formed by single rows of punctures, intervals slightly convex, lightly pubescent, 3rd interval forming a raised ridge anteriorly. Venation of hind wing (Fig. 18) similar to that in *Anilicus* Candèze.

Underside of body and legs black to ferruginous, moderately punctate, covered with fine golden brown hairs. Seventh abdominal sternite rounded in both sexes. Tibia bearing two ventral spines at distal end. Tarsi simple, filiform, segments decreasing in length from the 1st to the 4th, the 5th as long as the 1st; two equal claws.

Lateral lobes of aedeagus with large apical hook bearing setae; median lobe acuminate, extending beyond apices of lateral lobes, apex slightly deflected ventrally; furca wide and short (Figs. 20-22). Bursa copulatrix and spermathecal duct of female internal reproductive organs bearing large areas of chitinous spines.

The generic name is derived from the Greek words 'auge' meaning 'shine' or 'lustre', and 'notos' meaning 'back'. The name refers to the shine of the pronotal and elytral cuticle.

#### KEY TO SPECIES OF *AUGENOTUS*

- 1—Elytra blackish with four ferruginous spots, two basal and two towards the middle. . . .  
*A. quadriguttatus* (Erich.)
- Elytra bicoloured, but lacking spots . . . . 2
- 2—Elytra yellow ochre to ferruginous with blackish suture and apical margin. . . . .  
*A. australis* (Cand.)
- Elytra with basal third to two-thirds orange ochre to burnt sienna colour, remainder black. . . . . *A. aurantius* sp. nov.

*Distribution:* Tasmania (Fig. 19), Victoria, South Australia, New South Wales, and Queensland.

#### *Augenotus quadriguttatus* (Erichson), comb. nov.

(Figures 17-20; Plate 6, figures 15-16)

*Melanoxanthus quadriguttatus* Erichson, 1842: 139; Candèze, 1859: 520; Lea, 1908: 157.

*Anilicus quadriguttatus*, Candèze, 1863: 332; Neboiss, 1956: 58; 1961: 27.

The trivial name of this species is derived from the Latin *quadri*—'four' and *guttatus*—'spotted', referring to the ferruginous markings on the elytra. There are two small basal ferruginous spots on each side of the mesoscutellum, and two larger areas on either side of the suture near to the middle. The colour of these maculae varies from yellow ochre to burnt sienna; the elytral black frequently possesses a reddish tinge.

Head, antennae and pronotum blackish; the pronotum of some specimens possessing ferruginous bands on the lateral margins.

*Dimensions:* Length, ♂ 9.1-12.0 mm, ♀ 11.2-13.6 mm; width, ♂ 2.2-2.9 mm, ♀ 2.8-3.3 mm.

*Specimens examined:* 10 ♂, 10 ♀. MCZ, NMV, PM, QM, SAM, UT.

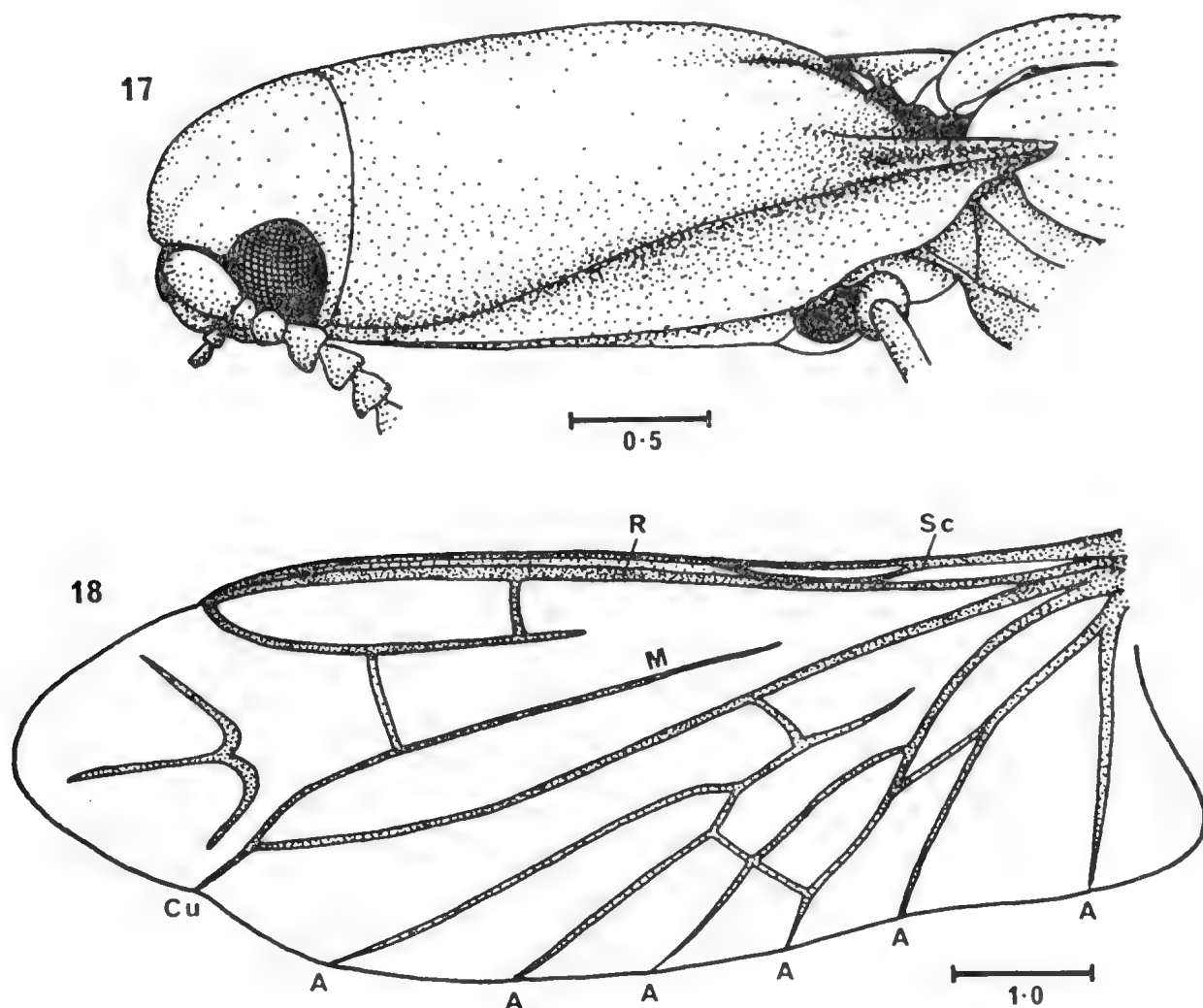
*Type data:* Location—ZM; Locality—'Tasmanian'.

*Distribution:* Tasmania (Fig. 19)—Cradle Mountain (Jan.), Lake St Clair—Cynthia Bay (Jan.), Frankford, Huon River, King Island (Dec.), Kingston Nat. Park (Jan.), Lake Pedder (Jan.), Sheffield (Dec.), Tewkesbury (Jan.), Tyenna (Dec.), Waratah, Wedge Bay (Jan.), Hartz Mt. (Feb.).

#### *Augenotus australis* (Candèze), comb. nov. (Figures 19, 21; Plate 6, figures 17-19)

*Melanoxanthus australis* Candèze, 1859: 520; Neboiss, 1956: 37; 1961: 17; Zwaluwenburg, 1959: 385.

The trivial name of this species is Latin for 'southern', indicating its Tasmanian distribution. This species is similar to *A. quadriguttatus* in many respects, but is notably different in its elytral markings. The elytra are mostly yellow



Figures 17–18—*Augenotus quadriguttatus* (Erich.)  
—17, ♂ pronotum and head, lateral  
view; 18, wing venation.

ochre to burnt sienna, with a darker area just posterior to the mesoscutellum; the mesoscutellum, suture and apical margins are black to reddish-black.

Head, antennae and pronotum black to reddish-black; pronotum exhibiting some colour variation as in *A. quadriguttatus*.

Lateral lobes of aedeagus (Fig. 21) with greater indentation below apical hook than in *A. quadriguttatus* (Fig. 20).

**Dimensions:** Length, ♂ 9.3–11.8 mm, ♀ 10.8–13.5 mm; width, ♂ 2.2–3.1 mm, ♀ 2.6–3.4 mm.

**Specimens examined:** 16 ♂, 8 ♀. ANIC, BM, FH, HOWITT, NMV, SAM, TDA.

**Type data:** Holotype probably ♀ (length, 10 mm), id. Candèze. Labelled 'type' (Fleutiaux's label). Location—PARIS (box 172); no locality.

**Distribution:** Tasmania (Fig. 19)—Buckland, Cressy (Jan.), Devonport, Hobart (Jan.), Huon River, Mount Barrow (Jan.), Orford (Jan.), Russell Falls (Dec.), Ulverstone, Wedge Bay (Jan.), Wilmot.

One ♂ specimen has a doubtful locality label—'Melbourne/Janson Coll. ex Candèze 1903' (BM).

**Pronotal colour variation in the Tasmanian species:** The Tasmanian species *A. quadri-*

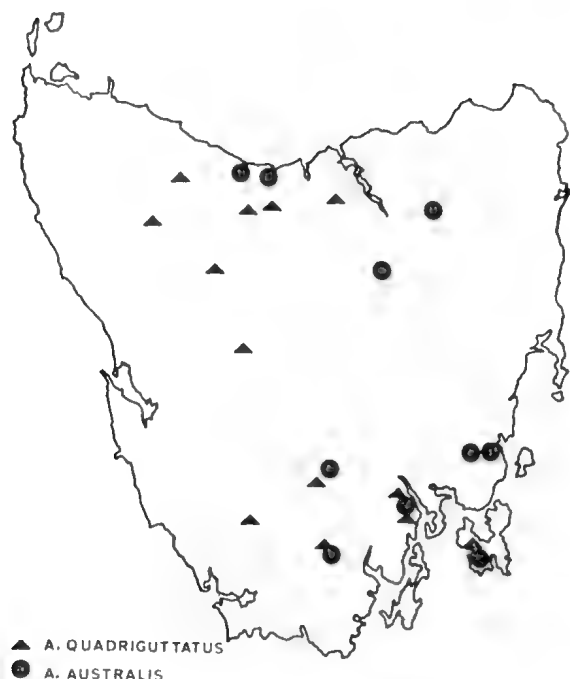


Figure 19—Recorded distribution of *Augenotus quadriguttatus* (Erich.) and *Augenotus australis* (Cand.) in Tasmania.

*guttatus* (Erichson) and *A. australis* (Candèze) exhibit variation in the colouration of the pronotum. The pronotum is generally entirely black or reddish-black in both species, but some specimens possess ferruginous markings. These consist of either lateral bands extending the full length of the pronotum and widening posteriorly (Pl. 6, fig. 19), or of small ferruginous areas immediately anterior to the carina. One specimen of *A. australis* (♂, Buckland) has an entirely ferruginous pronotum.

Specimens with pronotal colouration appear to be confined to eastern Tasmania, being most common in the south-east within about 50 km of Hobart. Pronotal markings are absent from specimens collected from areas further south (Huon River), south-west (Lake Pedder) and north-west (Cradle Mt., Lake St. Clair-Cynthia Bay, Devonport, Ulverstone).

This phenotypic variation is possibly related to climatic and vegetational factors. Guiler (1953) observed a similar phenomenon in the brush possum *Trichosurus vulpecula* (Kerr),

in which the distribution of black and grey colour phases was thought to be correlated with rainfall pattern.

### *Augenotus aurantius* sp. nov.

(Figure 22; Plate 6, figure 20)

This species was named for the orange colour present on the elytra, the basal third to two-thirds of which is an ochre to burnt sienna colour. Head, antennae, pronotum, meso-scutellum and apical portion of elytra black to reddish-black; black of elytra generally extending further along suture than lateral margin. Pronotum and elytra less glossy than in the Tasmanian species; more pubescent.

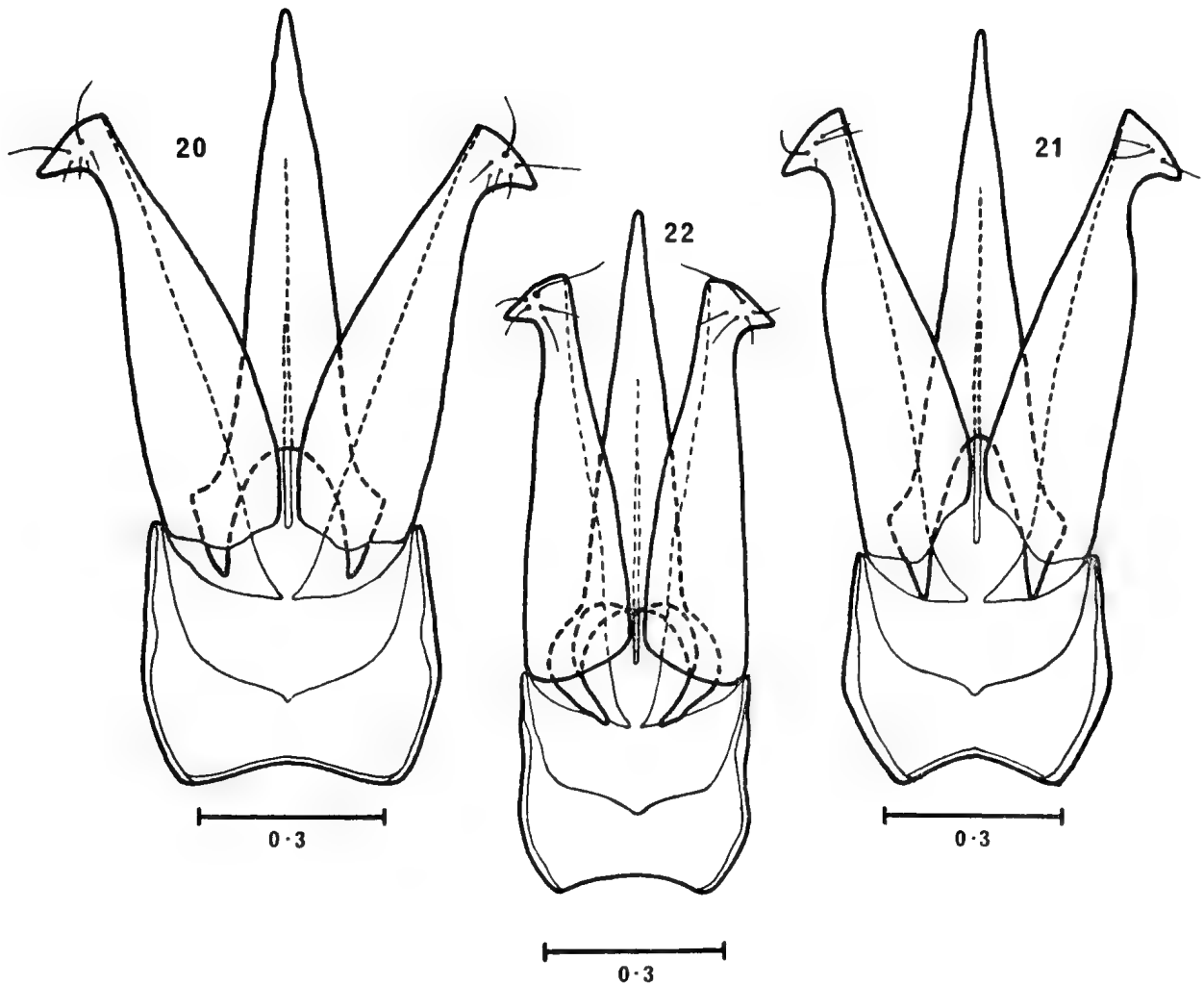
Aedeagus basically similar to that of *A. quadriguttatus* and *A. australis*, except that furca of median lobe is crescent-shaped (Fig. 22). Chitinous spines present in bursa copulatrix and spermathecal duct of female, arrangement similar to that of females of *A. quadriguttatus* and *A. australis*.

**Dimensions:** Length, ♂ 8.0–11.5 mm, ♀ 8.7–12.8 mm; width, ♂ 2.1–3.0 mm, ♀ 2.2–3.3 mm.

**Specimens examined:** 8 ♂, 18 ♀. AM, BM, FH, HOWITT, MACL, MCZ, NMV, QU, SAM.

**Type material:** Holotype ♂ Buxton, Marysville, Victoria, 10 Feb. 1921, Blackwood (NMV: T-4585); allotype ♀ Wigan River, Victoria, 26 Dec. 1914, E. T. Smith (NMV: T-4586); paratypes—♂ Erinundra Plateau, 48 km north of Club Terrace, Victoria, 3 Feb. 1970, Howick (NMV: T-4587); ♂ Mount Lofty, South Australia, J. G. O. Tepper (SAM); ♀ Gippsland, Victoria, (NMV: T-4588); ♀ Sherbrooke Forest, Belgrave, Victoria, 29 Dec. 1931, A. Musgrave (AM).

**Distribution:** Queensland—Nat. Park (not specified). New South Wales—Blue Mountains (Dec.), Mount Kosciusko (1,500 m, Dec.), Tumut Ponds (Feb.). Victoria—Buxton (Feb.), Erinundra Plateau (Feb.), Gippsland, Mordialloc (Melbourne), Sherbrooke Forest (Belgrave, Dec.), Wigan River (Dec.).



Figures 20–22—*Augenotus quadriguttatus* (Erich.)—20, aedeagus; *Augenotus australis* (Cand.)—21, aedeagus; *Augenotus aurantius*, sp. nov.—22, aedeagus.

### Genus *Anilicoides* Candèze (Figures 23–24)

*Anilicoides* Candèze, 1895: 52; Neboiss, 1956: 57.

*Type species: Anilicoides depressus* Candèze (by monotypy).

This genus has affinities with *Anilicus* Candèze from which members of *Anilicoides* Candèze are distinguished by their depressed thorax and abdomen, distinctive flattening of the posterior region of the pronotum, absence of a basal incisure internal to the carina, shape of the antennal segments (segments more

serrate in *Anilicus*) and mesoscutellum, and morphology of the aedeagus.

Frons densely punctate, anterolateral margin with ridge above antennae. Terminal segment of maxillary palps dolabriform. Antennae with 1st segment thickened, 2nd and 3rd small, rounded, of similar size, 4th to 10th segments triangular, subequal, with rounded vertices, 11th segment elongate.

Pronotum as wide as long (length and width measured medially), depressed, parallel-sided posteriorly, curvilinearly tapered anteriorly; posterior margin flattened, basal incisure of carina absent; median sulcus absent. Prosternal lobe arcuate anteriorly; prosternal suture with grooves for reception of antennae present anteriorly as in *Anilicus*.

Mesoscutellum elongate, oval, punctate, covered with long hairs. Elytra depressed, elongate, punctate striate, parallel-sided for two-thirds of length, curvilinearly tapered to apex; apices not divaricate.

Seventh abdominal sternite rounded posteriorly. Tarsi thickened, segments decreasing in length from 1st to 4th, 5th approximately equal in length to 1st; claws simple.

Lateral lobes of aedeagus with apical hooks; median lobe broad, tapering to a rounded point which extends beyond apices of lateral lobes; furca short; basal piece truncate (Figs. 23-24).

#### KEY TO SPECIES OF *ANILICOIDES*

- 1—Pronotum and elytra golden brown or testaceous . . . . . *A. depressus* Cand.  
—Pronotum and elytra dark brown to black . . . . . *A. haemorrhoidalis* (Cand.)

*Distribution:* Queensland and Western Australia.

#### *Anilicoides depressus* Candèze

(Figure 23)

*Anilicoides depressus* Candèze, 1895: 52; Neboiss, 1956: 57.

Entirely golden brown or testaceous, with antennae and legs paler than body; clothed in a semi-erect golden pubescence.

Antennae longer than pronotum. Labrum wider than long.

Pronotum punctate, depressions of moderate size, separated by a distance about equal to their diameters; hind angle with carina rounded and very close to the lateral margin, slightly divergent.

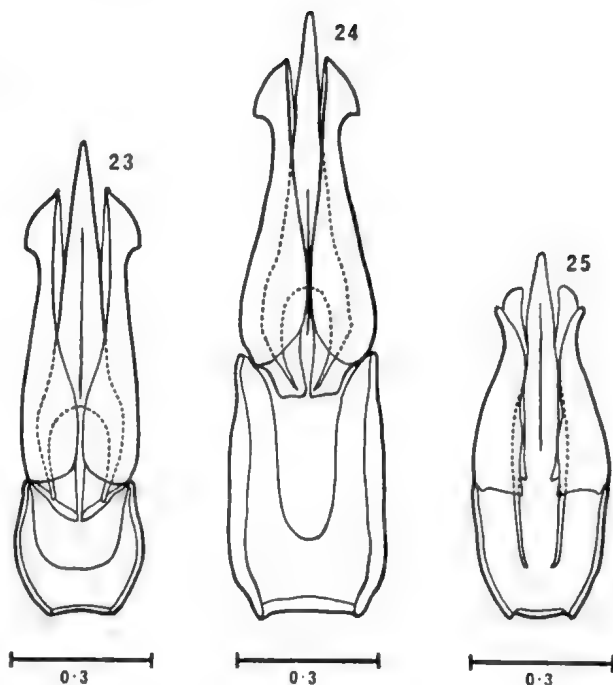
Aedeagus (Fig. 23) with basal piece approximately equal in length and width.

*Dimensions:* Length, 8.0-10.7 mm; width, 2.2-2.4 mm.

*Specimens examined:* 2 ♂, 1 of undetermined sex (probably ♀). AM, BM, NMV.

*Type data:* Holotype ♂ (length, 10.0 mm; width, 2.25 mm). Location—IRSNB; Locality—Peak Downs, Australia.

*Distribution:* Queensland—Clermont (♂), one specimen labelled 'N. Holl. Q'land'; another unlabelled.



Figures 23-25—*Anilicoides depressus* Cand.—23, aedeagus; *Anilicoides haemorrhoidalis* (Cand.)—24, aedeagus; *Melanoxanthus melanocephalus* (Fab.)—25, aedeagus.

#### *Anilicoides haemorrhoidalis* (Candèze), comb. nov.

(Figure 24; Plate 5, figure 11)

*Anilicoides haemorrhoidalis* Candèze, 1889: 120; Neboiss, 1956: 58.

This species was placed in *Anilicus* by Candèze, who distinguished it from other members of this genus by its more uniform dorsal colouration and the reddish colour of the last two abdominal segments, the name *haemorrhoidalis* being derived from the Greek words for 'red' and 'rump'. However, the morphological features of this species are sufficiently distinct to necessitate its removal from *Anilicus* Candèze. Its true affinities appear to lie with *Anilicoides depressus* Candèze. The genus *Anilicoides* Candèze has thus been redescribed to include *Anilicus haemorrhoidalis* Candèze.

Head, pronotum, mesoscutellum, elytra and underside of body of a deep brownish-black; antennae and legs golden brown to testaceous; 6th and 7th abdominal sternites reddish-

ferruginous; coarse, semi-erect, golden pubescence over entire body.

Head with small, hemispherical labrum. Antennae equal in length to pronotum.

Pronotum punctate, depressions small, separated by a distance greater than their diameters; hind angle short, carinate, hardly divergent. Prosternal suture of a reddish colour.

Basal piece of aedeagus longer than wide (Fig. 24).

*Dimensions:* Length, 6.5-7.8 mm; width, 1.8-2.2 mm.

*Specimens examined:* 6. Sexes undetermined. NMV, SAM.

*Type data:* Holotype probably ♀. Location—IRSNB; Locality—Australia, labelled 'Australia/Collection E. Candèze/*Anilicus haemorrhoidalis* Cd. det. E. Candèze/Type/n. sp. *haemorrhoidalis* Cd. Austral.', (the last label in Candèze's own handwriting).

*Distribution:* Western Australia—Guildford (Oct.), Pinjarra (Type comparison by Neboiss), 3 unlabelled.

### Genus *Melanoxanthus* Eschscholtz

*Melanoxanthus* Eschscholtz, 1836: tab; Candèze, 1859: 510.

*Type species:* *Elater melanocephalus* Fabricius (by monotypy; see Hyslop, 1921).

#### *Melanoxanthus melanocephalus* (Fabricius)

(Figure 25; Plate 5, figure 12)

*Elater melanocephalus* Fabricius, 1781: 272; 1801: 239; Neboiss, 1956: 37.

*Elater nigroterminatus* Macleay, W. S., 1827: 441, syn. nov.

*Melanoxanthus melanocephalus*, Candèze, 1859: 512; Zwaluwenburg, 1942: 53; 1959: 387, 390; Neboiss, 1961: 17.

*Anilicus nigroterminatus*, Candèze, 1891: 192; Neboiss, 1956: 58.

Zwaluwenburg (1959) provides descriptions and a key to some *Melanoxanthus* species in the Genoa Museum (Museo Civico di Storia Naturale 'Giacomo Doria', Genoa), from which it was found that *Anilicus nigroterminatus* (Macleay, W. S.) keyed out to be *Melanoxanthus melanocephalus* (Fabricius). In addition, Fabricius's original description (1781) of *Melanoxanthus melanocephalus* and a specimen identified by C. M. F. Hayek (BM) as *M. melanocephalus* (Fabricius) agree well

with W. S. Macleay's description and type specimen of *Anilicus nigroterminatus*, indicating the synonymy of the two species.

*Description:* Dark luteo-saffron yellow, sub-opaque, with dorsal surface of head, antennae, macula of pronotum, elytral apex and lateral margins of 6th and 7th abdominal sternites black to brownish-black; covered with a short, coarse pubescence of the same hue as the ground colour.

Head small, very rounded, densely punctate; anterior margin of frons tapering to a rounded point. Labrum small and hemispherical. Mandibles bidentate. Maxillary palps with long slender segments. Antennae as long as pronotum; 1st segment thickened, its anterior margin with a narrow longitudinal ridge, 2nd and 3rd segments small and rounded, 4th to 10th segments triangular and subequal at proximal end, equal and more rectangular distally, 11th segment hexagonal, parallel-sided for most of its length, tapering to a rounded point.

Pronotum slightly longer than wide (length and width measured medially), punctate, with the depressions separated by a distance equal to their diameters, diameters larger posteriorly; convex; median sulcus only distinct at posterior margin; hind angles hardly divergent, carina well-defined, close to lateral margin. Macula of pronotum sub-acuminate, widest at anterior margin, reaching beyond middle. Prosternal lobe arcuate anteriorly; prosternal grooves for reception of antennae absent; prosternal process long, narrow and punctate.

Mesoscutellum punctate, triangular, narrow and acuminate. Elytra punctate-striate, with single rows of regularly spaced circular punctures, parallel-sided for two-thirds of length, curvilinearly tapered to apex, the latter truncate and divaricate.

Seventh abdominal sternite rounded apically, or rounded but bearing a central inflection on distal margin.

Aedeagus (Fig. 25) with lateral lobes and basal piece fused; apices of lateral lobes bidentate, deflected ventrally; median lobe narrowing near middle, widening anteriorly, acuminate at apex, apex deflected ventrally;

basal piece about as long as lateral lobes and truncate at base. Bursa copulatrix of female without sclerotization.

*Dimensions:* Length, 7.0-9.1 mm; width, 1.7-2.3 mm.

*Specimens examined:* 9. MACL, NMV, SAM.

*Type data:* Holotype *Elater melanocephalus* Fabricius, sex undetermined (length, 9.4 mm). Location—BM (Banks collection); no locality label. The original description reads 'Habitat in Coromandel. Mus. Dom. Banks'.

Holotype *Elater nigroterminatus* Macleay, W. S. Location—MACL (now in ANIC); Locality—New Holland, labelled '*E. nigroterminatus* Mc.L. New Holland, Capt. King/*Anilicus nigroterminatus* W. S. MacL. Type. Australia'. (Actual type seen.)

*Distribution:* Cocos Keeling Is., Dili (Timor, Mar., at light), Java (Jan.-Feb.), Cape York Area or North Australian Coast, Ovalau (Fiji), Vitu Levu (Fiji). Zwaluwenburg (1942) wrote of *Melanoxanthus melanocephalus* (Fabricius) 'A single specimen was taken by Swezey in a house in Piti, Sept. 9, 1936. It occurs throughout the Pacific area, and westward to the islands of the Indian Ocean.' In 1959 Zwaluwenburg reported that a specimen in the Musée Nationale d'Histoire Naturelle, Paris, identified by Fleutiaux, was from New Zealand.

*Remark:* A single specimen of a species that is apparently closely related to *Melanoxanthus melanocephalus* (Fabricius) has been collected from Claudie River, North Queensland (NMV) (Pl. 5, fig. 13), and probably constitutes a new species. More material is required before a description can be made.

#### Genus *Acroniopus* Erichson

*Atelopus* Erichson, 1842: 142.

*Acroniopus* Erichson, 1843: 175; Neboiss, 1956: 62.

*Type species:* *Atelopus humilis* Erichson (original designation).

#### *Acroniopus rufipennis* Macleay, W. J.

Plate 5, figure 14)

*Acroniopus rufipennis* Macleay, W. J., 1872: 259; Carter, 1939: 326; Neboiss, 1956: 63.

*Anilicus flavipennis* Candèze, 1878: 192, syn. nov.; Neboiss, 1956: 58.

The proposed synonymy of *Acroniopus rufipennis* Macleay, W. J. and *Anilicus flavi-*

*pennis* Candèze is based on the examination of specimens compared with the types of both 'species' by Arturs Neboiss.

Head black to reddish-brown, punctate, pubescent and declined downward; frons ridged above antennae. Labrum small and hemispherical. Mandibles short, broad and acuminate. Maxillary palps slender, distal segment parallel-sided. Antennae ferruginous to brown, longer than pronotum; 1st segment thickened, 2nd and 3rd small and elongate, 4th to 10th segments elongate, triangular and subequal, 11th segment elongate.

Pronotum wider than long (length and width measured medially), ferruginous to brownish-black with ferruginous margins, densely punctate, pubescent and convex; median sulcus absent; carina close to lateral margin. Prosternal lobe arcuate anteriorly; antennal grooves absent.

Mesoscutellum triangular, acuminate, reddish-black to ochre coloured. Elytra yellow ochre, pubescence of same hue as ground colour, punctate-striate, intervals slightly convex, 3rd and 4th striae fusing posteriorly, parallel-sided for half of length, curvilinearly tapered to apex, apices not divaricate.

Underside ferruginous to reddish-black, ochre coloured along lateral margins of abdomen, pubescent. Seventh abdominal sternite arcuate posteriorly. Legs yellow ochre; tarsal segments decreasing in length from 1st to 4th, 5th segment as long as the 2nd; two simple claws.

Genitalia not described.

*Dimensions:* Length, 4.5-5.2 mm; width, 1.5-1.8 mm.

*Specimens examined:* 7. MACL, NMV, QM, SAM.

*Type data:* Holotype *Acroniopus rufipennis* Macleay, W. J. (length, 5.2 mm). Location—AM; Locality—Gayndah, Queensland.

Holotype *Anilicus flavipennis* Candèze (length, 5.0 mm; width, 1.3 mm). Location—IRSNB; Locality—Tropical Australia, Rockhampton.

*Distribution:* Queensland—Cairns District, Magnetic Island, Rockhampton, Gayndah, Nat. Park (Dec.).



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The paper is based on a thesis that was submitted to the department of Zoology, Monash University, in 1974 in partial fulfilment of the requirements for the degree of Bachelor of Science with Honours.



**Explanation of Plates**

Specimens to approximately same scale (x 7), except figures 7, 9 and 14 which have been magnified 9 times.

**PLATE 4**

- Figure 1—*Anilicus attenuatus* Cand. ♂ (NMV).  
 Figure 2—*Anilicus xanthomus* (Macl. W. S.) ♂ (JB).  
 Figure 3—*Anilicus xanthomus* (Macl. W. S.) ♀ (NMV).  
 Figure 4—*Anilicus loricatus* Cand. ♂ (NMV).  
 Figure 5—Mesostigmatid mites on the dorsal surface of *Anilicus loricatus* Cand. (Bunbury, W.A., ANIC).  
 Figure 6—Mesostigmatid mites on the ventral surface of *Anilicus loricatus* Cand. (Pinjarra, W.A., NMV).

**PLATE 5**

- Figure 7—*Anilicus rectilineatus*, sp. nov., Holotype ♂ (NMV).

- Figure 8—*Anilicus rectilineatus*, sp. nov. ♀ (AM).  
 Figure 9—*Anilicus parvus*, sp. nov. ♂ (AM).  
 Figure 10—*Anilicus parvus*, sp. nov. ♀ (QM).  
 Figure 11—*Anilicoides haemorrhoidalis* (Cand.), 3 specimens (NMV).  
 Figure 12—*Melanoxanthus melanocephalus* (Fab.) ♀ (NMV).  
 Figure 13—Undescribed species related to *Melanoxanthus melanocephalus* (Fab.) (NMV).  
 Figure 14—*Acroniopus rufipennis* (Macl. W. J.) (SAM).

**PLATE 6**

- Figure 15—*Augenotus quadriguttatus* (Erich.) ♂ (NMV).  
 Figure 16—*Augenotus quadriguttatus* (Erich.) ♀ (NMV).  
 Figure 17—*Augenotus australis* (Cand.) ♂ (FH).  
 Figure 18—*Augenotus australis* (Cand.) ♀ (NMV).  
 Figure 19—*Augenotus australis* (Cand.) ♀ (QM) exhibiting pronotal colour variation.  
 Figure 20—*Augenotus aurantius*, sp. nov., Holotype ♂ (NMV).



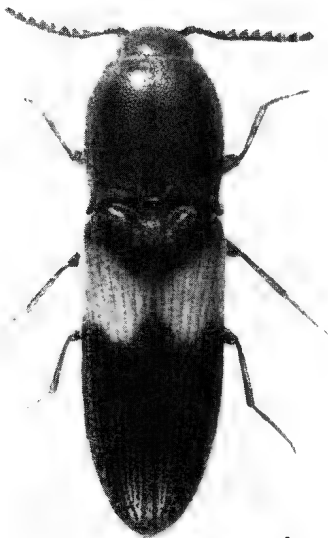
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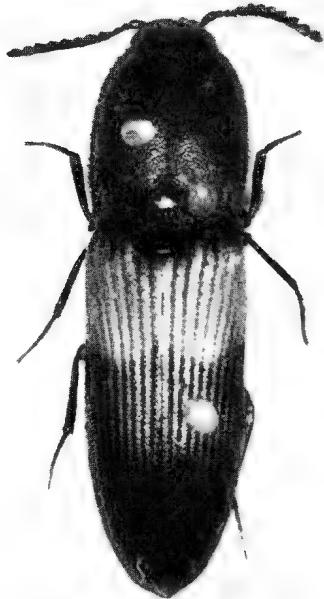
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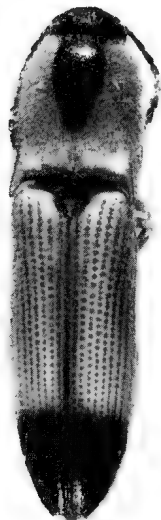
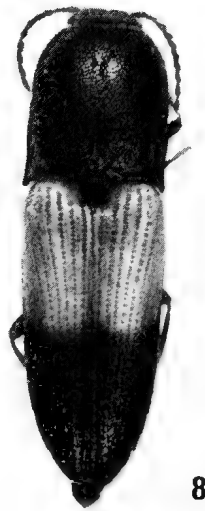
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# GASTROPODS FROM SOME EARLY DEVONIAN LIMESTONES OF THE WALHALLA SYNCLINORIUM, CENTRAL VICTORIA

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## Abstract

Seventeen gastropods from Devonian limestones at Marble Creek (also known as Toongabbie), Deep Creek and Loyola within the Walhalla synclinorium are described. These include four new forms: *Platyceras* (*Platyceras*) *mansfieldense* and *P. (Praenatica)* sp. A. from Loyola, and *P. (Platyceras)* sp. A. and *P. (Orthonychia)* sp. A. from Marble Creek. The other described forms are all platyceratids except *Tremanotus cyclocostatus* and *Michelia* sp. from Marble Creek, *Oriostoma* sp. n., and an indeterminate turbiniform gastropod from Deep Creek and *Scalaetrochus lindströmi* from Loyola. *Tropidodiscus centrifugalis* and *Temnodiscus pharetroides* from the mudstones at Loyola are also redescribed. The gastropod faunas of the limestones are dominated by coprophagic platyceratid gastropods and constitute further examples of this widely known crinoid-gastropod association.

## Introduction

The limestone deposits along the eastern limb of the Walhalla synclinorium each consist of a number of small lenses of limestone. The deposits extend about 120 km from Loyola in the north, about 130 km north-east of Melbourne, to Marble Creek in the south, about 140 km east of Melbourne. The limestone at Loyola was the first to be noted in print. Selwyn and Ulrich (1867, p. 35) provided a chemical analysis of a 'white limestone from near Mansfield'. The first note of fossils appears to be that of McCoy, who considered the limestone to be Palaeozoic and was quoted to this effect by Couchman (1877, p. 19). Chapman (1914) mentioned an unidentified form of gastropod and in 1916 he described two gastropods from the Loyola Limestone, *Platyceras cornutum* Hisinger and *Orthonychia brevis* Chapman. However, the latter is one of the nautiloids which are quite common at Loyola. He also described two species of gastropods from the associated mudstones, *Temnodiscus pharetroides* and *Euomphalus centrifugalis*. Since then no further work on the gastropod fauna has been undertaken.

The limestone deposit with the least known fauna is that at Deep Creek, about 6 km east of Walhalla. Together with the limestone at Marble Creek (also known as Toongabbie), it appears to have been first noted by Murray (1878, p. 48). The only mention of a gastropod from this locality is by Chapman (1916) who described *Platyceras minutum*.

Gastropods from the Toongabbie Limestone, Marble Creek, were first noted by McCoy who observed 'some traces of Gasteropoda, apparently of the genus *Acroculia*, too imperfect to render determination possible, and a fragment of *Bellerophon*' Murray (1878, p. 49). Chapman (1907) noted the presence of *Niso (Vetotuba) brazieri* Etheridge and *Trochus (Scalaetrochus)* sp. In 1916 he noted *Tremanotus pritchardi* Cresswell and *Coelocaulus brazieri* (Etheridge) and described *Diaphorostoma incisum*.

Talent and Philip (1956), when describing the gastropod fauna from Marble Creek, erected two new genera, *Ostlerina* and *Cowwarrella*. They also described eight new species and mentioned three poorly known forms. These two new genera were subsequently synonymized by Knight *et al.* (1960).

The lack of work both locally and internationally on Middle Palaeozoic gastropod faunas makes comparison with assemblages of similar age difficult, and has also resulted in a number of genera being used in a very wide sense. As a result of the lack of definition of generic limits, the species described here are compared with the type species as well as other species from south-eastern Australia.

In this study the following abbreviations have been used:

P, National Museum of Victoria Palaeontological Collection;

M.U.G.D., Melbourne University Geology Department;

G.S.V., Geological Survey of Victoria Collection, now housed in the National Museum of Victoria.

All measurements are in millimetres and the following symbols relating to the measurements have been used:

Hap, height of aperture; Ht, total height of shell; L, length measured at the selenizone in the bellerophontids; Lap, length of aperture; Wap, width of aperture; Wh, total number of whorls in shell; Wlt, width at last trema; Wt, total width of shell; \*, specimen incomplete.

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### Age of the faunas

As knowledge of Middle Palaeozoic gastropods is limited, they do not contribute significantly towards age determinations of the limestones. In this instance the situation is further aggravated by the domination of Platyceratids in each of the gastropod faunas. Most discussions about the age of the limestones at Marble Creek and Deep Creek have usually considered them to be of the same age. This is supported by the presence of the distinctive *Platyceras (Visitor) cylindricum* at both localities. Strusz (1972) assessed the available information from both these localities and considered them to be Late Siegenian.

The age of the Loyola Limestone has been argued for some time. Most recently Cooper (1973) noted the presence of a polygnathan conodont element in the fauna and considered the limestone to be Early Emsian. This age determination has been accepted by other workers (Strusz, 1972; Vandenberg *et al.*, 1976).

Discussion of the ages of these limestones must be placed in the perspective of comments

by Philip (1974). He discussed the current uncertainty in correlations between the different facies of the Lower Devonian stages in Europe. Because of this present uncertainty, their application in Australia should not be dogmatic.

The gastropod evidence for age determinations at Loyola is minimal. *Scalaetrochus lindströmi* occurs at both Lilydale and Loyola. It is generally considered that the Lilydale Limestone is Late Siegenian (Strusz, 1972). However, the only other known occurrence of this genus is *Scalaetrochus fragosus* from the Middle Devonian Anderdon Limestone, Ontario, Canada (Linsley, 1968).

Within the mudstone surrounding the limestone lenses at Loyola, *Straparollus (Straparollus) serpenteus* Talent and *Loxonema* sp. nov. of Talent (1963) occur. These gastropods were originally described from the Kilgower Member, Tabberabbera by Talent (1963). This unit was considered by Strusz (1972) to be Late Siegenian-Emsian in age.

### Palaeoecology

The limestone at Marble Creek is composed largely of crinoidal fragments together with a few corals and stromatoporoids. In comparison with the crinoids and coelenterates the other faunal elements comprise only a small percentage of the fauna. These minor elements include gastropods, bivalves, nautiloids, rostroconchians (notably *Conocardium*), brachiopods and trilobites. This faunal abundance and diversity is in complete contrast to that of the surrounding mudstones which are virtually unfossiliferous (Talent, 1956).

The commensal relationship between the coprophagic gastropods of the family Platyceratidae and crinoids has been known for a long time. Lane (1973) described in detail such a relationship from the Carboniferous of Indiana. At Marble Creek the disarticulated nature of the crinoid crowns implies some post-mortem transport. Although the gastropod fauna at Marble Creek is dominated by members of the Platyceratidae, none have been found *in situ* on a crinoid crown.

Apart from the dominant platyceratids, the gastropod fauna from Marble Creek is limited.

*Tremanotus cyclocostatus* is considerably smaller than *T. pritchardi* from the Lilydale Limestone of comparable age. Also present are poorly preserved specimens of *Michelia* sp. Again considerably larger forms are known from both the Lilydale Limestone and the slightly younger limestone at Taemas, N.S.W. Chapman (1907) noted the presence at Marble Creek of *Scalaetrochus* sp. but this specimen has not been relocated.

The gastropod fauna of the Toongabbie Limestone is markedly different from the only other adequately known Lower Devonian gastropod fauna from Victoria, that of the Lilydale Limestone. This latter fauna from a protected shallow marine environment is dominated by large gastropods, both high-spired and planispiral (Tassell, 1976). Significantly, no coprophagic gastropods are known from this limestone. Also this limestone is not dominated by crinoidal fragments.

The limestones at Deep Creek differ in composition from those at Marble Creek in a number of ways. They are not dominated by crinoidal remains; rather, corals comprise the major biological component of the limestone. The minor components of the Marble Creek fauna are considerably more important constituents of the Deep Creek Limestone. This is so particularly of bryozoa, ostracods and brachiopods. Other minor components include trilobites, algae, rostroconchians, bivalves and gastropods.

The total fauna at Deep Creek is as diverse as the faunas from both Marble Creek and Loyola. But the gastropod fauna, dominated by platyceratids, is noticeably less diverse. In the case of the coprophagic platyceratids, this may be a reflection of the limited number, or diversity, of the crinoids. Not only is the gastropod fauna of restricted diversity, it is also composed only of small forms. The most abundant gastropod *P. (P.) minutum* rarely exceeds 5 mm in diameter. *P. (V.) cylindricum* at Deep Creek is smaller in all cases than members of that species at Marble Creek. An explanation of such apparent dwarfing is not readily apparent, particularly as none of the other faunal elements exhibits such a tendency. The limestone at Loyola consists of four dis-

ting bodies of limestone interbedded with the surrounding highly fossiliferous mudstones (Cooper, 1973). This limestone exhibits a great deal more variation in composition than the limestones from Deep Creek and Marble Creek. In part it is composed largely of crinoidal material only slightly disarticulated. Coelenterates dominate the limestone in other areas.

The total fauna of the limestones is diverse but the gastropod component is quite limited being represented by only a few species. However, there is no tendency at Loyola towards reduction in size; rather the platyceratids from this limestone are comparable in size to, or larger than, those from Marble Creek.

The low gastropod diversity of the limestones is in marked contrast to the gastropod fauna of the associated mudstones. Chapman (1916) described from the mudstones ? *Temnodiscus pharetroides* and *Tropidodiscus centrifugalis* as well as noting *Platyceras cornutum*. *Straparollus* (*Straparollus*) *serpenteus* Talent and *Loxonema* sp. nov. of Talent 1963 also occur in the mudstones.

### Systematic descriptions

|           |   |
|-----------|---|
| Family    | BELLEROPHONTIDAE McCoy, 1851                |
| Subfamily | TROPIDODISCINAE Knight, 1956                |
| Genus     | <i>Tropidodiscus</i> Meek and Worthen, 1866 |

*Type Species: Tropidodiscus curvilineatus* (Conrad), 1842; Lower Devonian; Schoharie, New York, U.S.A.

***Tropidodiscus centrifugalis* (Chapman), 1916**

(Plate 7, figure 5)

1916 *Euomphalus centrifugalis* Chapman, pp. 89, 101, pl. 4, figs. 30-31, pl. 6, figs. 54-55.

**Diagnosis:** Small form of genus with foliaceous growth lines that vary slightly during growth and are moderately widely spaced.

**Description:** Small to medium-sized form with prominent angular dorsal crest; whorl profile gently rounded from the angular dorsal crest to the edge of the umbilici, then rounded more



strongly; umbilici moderately deep and wide; aperture not greatly expanded, sub-triangular in shape; parietal lip probably thin, with high ridge formed by dorsal angulation of preceding whorl; outer lip with a deep v-shaped sinus culminating at the dorsal angulation in a narrow slit that probably produces a narrow selenizone; shape of outer lip slightly variable throughout growth; selenizone details unknown; collabral lines moderately widely spaced, tendency to be foliaceous.

*Dimensions* (in mm):

|        | L    | Wh |
|--------|------|----|
| P12844 | 13.7 | 5  |
| P12845 | 9.1  | 4  |
| P41828 | 12.1 | 5  |

*Location of Types:* National Museum of Victoria. Holotype, P12844. Paratype, P12845.

*Type Locality:* Chapman designated the holotype as the specimen from Killara and the paratype as the specimen from Loyola. In his plate explanation (p. 101) this situation is reversed with the Loyola specimen being designated as the holotype. The specimen from Loyola is both an external mould and internal mould whereas the specimen from Killara is only an external mould. In view of this, the specimen from Loyola is accepted as the holotype.

*Material:* Holotype, paratype and 12 other specimens.

*Discussion:* Comparison between this species and the type species is limited by the mode of preservation of the former. The larger *T. curvilineatus* appears to have a deeper sinus and more regular growth lines than *T. centrifugalis*. The growth lines of *T. centrifugalis* appear to be more foliaceous than those of the type species. Otherwise, little comparison can be made between the two species.

*T. centrifugalis* differs from *Tropidodiscus* sp. A. described by Talent (1963) from the Kilgower Member, Tabberabbera, in the coarser, more widely spaced nature of its collabral lines.

Genus *Temnodiscus* Koken, 1896

*Type Species:* *Temnodiscus lamellifer* (Lindström), 1884; Middle Silurian; Visby, Gotland, Sweden.

### ? *Temnodiscus pharetroides* Chapman

(Plate 3, figure 1)

1916 *Temnodiscus pharetroides* Chapman, p. 78, pl. 2, figs. 4-5, pl. 6, figs. 50-51.

*Description:* Small planispiral form with a distinctive dorsal crest; whorl profile from angular dorsal crest moderately curved to edge of umbilici where it is rounded more strongly into the umbilici aperture flared, sub-ovoidal in shape; final whorl expanded, whorls few in number; other details unknown because of poor preservation.

*Dimensions:*

|        | L   | Ht  | Wt  |
|--------|-----|-----|-----|
| P12835 | 7.1 | 6.6 | 4.2 |

*Location of Types:* National Museum of Victoria. Holotype, P12835.

*Type Locality:* Loyola.

*Material:* Holotype.

*Discussion:* The holotype is an internal mould which shows clearly a dorsal crest; otherwise there is little diagnostic information. The assignment by Chapman of this single specimen to the genus *Temnodiscus* on such inadequate material is unwarranted. Furthermore, there is no evidence on the holotype of a sculpture of concentric rugae as claimed by Chapman. Until more specimens can provide further information, the specimen is left tentatively in this genus. Talent (1963) described two species of *Temnodiscus* from the similarly aged mudstones of the Kilgower Member in the Tabberabbera area of eastern Victoria.

Family SINUITIDAE Dall (in Zittel-Eastman, 1913)

Subfamily TREMANOTINAE Peel, 1972

Genus *Tremanotus* Hall, 1865  
(= *Boiotremus* Horny, 1962)

*Type Species:* *Tremanotus alpheus* Hall, 1865; Middle Silurian; Bridgeport, Illinois, U.S.A.

*Tremanotus cyclocostatus* Talent and Philip, 1956

(Plate 7, figures 9, 13)

1916 *Tremanotus pritchardi* Cresswell; Chapman, p. 79 (in part).

1956 *Tremanotus cyclocostatus* Talent and Philip, p. 61, pl. 6, figs. 11 & 15, pl. 7, figs. 16-17, text fig. 4.

**Diagnosis:** Small form of genus with fine growth lines and sculptural elements which can be quite sinuous; few foliaceous growth rugae, irregularly developed.

**Description:** Medium, widely umbilicate, planispiral form with a widely expanded aperture in the final growth stage; whorl profile gently arched dorsally, more strongly curved on the sides when turning into the wide, deep, umbilici; concave on the inner or columellar surface; aperture in final growth stage sub-oval, greatly expanded; neither a sinus nor tremata developed on the dorsal surface of the expanded region; the outer lip before the final growth stage strongly deflected posteriorly from the columellar lip and culminates in a small slit situated medially on the dorsal crest of the outer surface; along the selenizone formed by the slit numerous evenly spaced, sub-rectangular tremata are developed; the number of open tremata unknown; between tremata the growth lines directed posteriorly towards the earlier tremata; prominent foliaceous rugae are rarely developed; growth lines typically very fine and closely spaced; sculpture composed of at least two orders of fine spiral elements; sculpture irregularly spaced and frequently quite sinuous; growth lines and sculpture form a reticulate pattern over whorl surface; sutures deep.

**Dimensions:**

|               | L   | Wt  | Lap | Wap | Wlt  | Wh |
|---------------|-----|-----|-----|-----|------|----|
| M.U.G.D. 2279 | 24* | 12* | —   | —   | 11.5 | 5  |
| M.U.G.D. 2167 | 19* | —   | —   | —   | 11*  | —  |
| P913          | 47* | —   | —   | —   | 17*  | 5+ |

**Location of Types:** Melbourne University Geology Department. Holotype, M.U.G.D. 2279. Paratype, M.U.G.D. 2167. Hypotype, M.U.G.D. 5031.

**Type Locality:** Toongabbie Limestone, lower quarry, Marble Creek.

**Material:** Holotype and counterpart, one paratype, one hypotype and one other specimen.

**Discussion:** Comparison between this species and the type species is limited by the nature of preservation of the American species. However, *T. cyclocostatus* is considerably smaller and has very much finer growth lines and sculptural elements. It has fewer foliaceous

growth rugae and those present are irregularly developed. The finer spiral sculpture is more numerous and irregular, often becoming quite sinuous.

*T. cyclocostatus* differs in a number of ways from *T. pritchardi* Cresswell, the only other species described from Victoria (Tassell, 1976). It is considerably smaller in size and has much finer growth lines and sculptural elements. The spiral sculpture of *T. cyclocostatus* is not as frequent and becomes quite sinuous in places. The growth rugae are less frequently developed and those present are not as prominent as in *T. pritchardi*. During the growth stages prior to the development of the flared aperture the outer lip of *T. cyclocostatus* is deflected more strongly posteriorly. Whereas the inner lip of *T. pritchardi* is straight, that of *T. cyclocostatus* is distinctly convex inwards.

Chapman (1916), when discussing *T. pritchardi* from the Lilydale Limestone, noted that a specimen from the Thomson River had larger tremata and a spiral sculpture that was more sinuous. However, he considered it to be *T. pritchardi*. Re-examination of this specimen P913 reveals that it is quite clearly distinguishable from *T. pritchardi* and identical with *T. cyclocostatus*.

Family PLATYCERATIDAE Hall, 1859

Genus *Platyceras* Conrad, 1840

Subgenus *Platyceras* (*Platyostoma*) Conrad, 1842

**Type Species:** *Platyostoma ventricosum* Conrad, 1842; Lower Devonian; near Saugerties, New York, U.S.A.

**Discussion:** Talent and Philip (1956, p. 59) erected a new genus *Ostlerina*, distinguished by being naticiform, narrowly umbilicate, without a sinus, with sculpture composed only of growth lines and a simple nucleus. The type species and only member of the genus was *Ostlerina delicata* Talent and Philip from both the quarries at Marble Creek. Subsequently Knight *et al.* (1960, p. 1240) synonymized this genus with the subgenus *P. (Platyostoma)*. The assignment of the form from Marble Creek to *Platyostoma* required the expansion of the subgeneric concept to include minutely umbilicate forms.

**Platyceras (Platyostoma) incisum** Chapman,  
1916

(Plate 7, figures 6, 14)

1916 *Diaphorostoma incisum* Chapman, p. 99, pl. 5, fig. 46, pl. 6, fig. 59.

1956 *Ostlerina delicata* Talent and Philip, p. 59, pl. 6, figs. 1-4, text figs. 2-3.

**Diagnosis:** Medium, explanate, minutely umbilicate form of the subgenus.

**Description:** Medium, explanate, naticiform, minutely umbilicate gastropod with several whorls; last whorl greatly expanded; spire short, low; whorl profile moderately to gently arched with a tendency to become flatter on the last whorl; sutures adpressed; columellar lip long, thin and arcuate; no apparent parietal inductura; outer lip thin, prosocyr and slightly irregular; subcircular aperture large and very shallow; growth lines irregular, becoming coarser with age; no other sculpture present.

**Dimensions:**

|               | Ht   | Wt   | Wh |
|---------------|------|------|----|
| P1083         | —    | —    | 3  |
| M.U.G.D. 2164 | 15.5 | 24.8 | 3  |
| M.U.G.D. 2165 | 13.8 | 22.6 | 3  |
| M.U.G.D. 2178 | —    | —    | 3  |

**Location of Types:**

(i) *D. incisum*. National Museum of Victoria. Holotype, P1083. Previously 91F, Geological Survey of Victoria Collection.

(ii) *O. delicata*. Melbourne University Geology Department. Holotype, M.U.G.D. 2164. Paratypes, M.U.G.D. 2165 and 2178.

**Type Locality:**

(i) *D. incisum*, Toongabbie Limestone, northern outcrop (or lower quarry), Marble Creek.

(ii) *O. delicata*, Toongabbie Limestone, upper quarry, Marble Creek.

**Material:** Holotype, 3 hypotypes and 13 other specimens.

**Discussion:** The type locality for *D. incisum* is the northern outcrop of limestone, the site of the lower quarry of Talent and Philip (1956, text fig. 1). *O. delicata* is moderately common at this site, more so than at the upper quarry where it is 'relatively rare' (Talent and Philip, 1956). Comparison of all the material from both quarries indicates that *O. delicata* is a junior synonym of *P. (P.) incisum*.

*P. (P.) incisum* differs from the type species

most importantly in possessing a minute umbilicus. It is also more explanate, has a lower spire, more rapidly expanded whorls and a very much larger aperture. The type species has an obviously developed parietal inductura, a structure wanting on *P. (P.) incisum*.

**Platyceras (Platyostoma) triangulare** Talent  
and Philip, 1956  
(Plate 7, figure 4)

1956 *Platyostoma triangularis* Talent and Philip, p. 64, pl. 4, figs. 5-6.

**Diagnosis:** Small, naticiform gastropod with moderately irregular aperture and whorl profile which becomes angular with growth.

**Description:** Small, naticiform gastropod with rapidly expanding whorls; large last whorl; low spire; whorl profile changes with growth, initially well rounded from the upper suture to the base with the periphery at mid-whorl; with growth whorl profile becomes more angular, gently rounded to nearly flat from upper suture to angular shoulder then nearly flat outer whorl surface to sub-angular basal periphery; base nearly flat; umbilicus lacking; sutures change from canaliculate to impressed with growth; outer lip moderately thick, from the upper suture it passes backwards to the shoulder, on the outer whorl surface it is gently opisthocyr, forming a shallow wide sinus, from the basal periphery it passes backwards across the base; inner lip not known; aperture large, irregular; sculpture of growth lines only.

**Dimensions:**

|               | Ht  | Wt   | Wh |
|---------------|-----|------|----|
| M.U.G.D. 2175 | 7.6 | 11.5 | 1  |

**Location of Types:** Melbourne University Geology Department. Holotype, M.U.G.D. 2175.

**Type Locality:** Toongabbie Limestone, lower quarry, Marble Creek.

**Material:** Holotype.

**Discussion:** *P. (P.) triangulare* differs substantially from *P. (P.) incisum*, the other species of the subgenus occurring at Marble Creek. Besides being much smaller than *P. (P.) incisum*, it is characterized by a whorl profile which becomes progressively more angular. It lacks an umbilicus and is more naticiform in shape than the explanate *P. (P.) incisum*. The

latter's growth lines are also considerably finer.

Comparison of *P. (P.) triangulare* with the type species is limited by the lack of material from Marble Creek. It is smaller and more irregular. The whorl profile becomes progressively more angular with growth and the outer lip is more irregular.

Subgenus *Platyceras* (*Platyceras*) Conrad, 1840  
*Type Species: Pileopsis vetusta* J. de C. Sowerby, 1829; Lower Carboniferous; Queens County, Ireland.

***Platyceras* (*Platyceras*) *decorum* Talent and Philip, 1956**

1956 *Platyceras decorum* Talent and Philip, p. 64, pl. 7, fig. 21.

**Diagnosis:** Small horn-shaped form of subgenus with a sinuous to near crenulated small sub-circular aperture.

**Description:** Small, irregular coiled, horn-shaped gastropod with about two whorls; nucleus and initial whorl coiled discoidally and in contact; last whorl rapidly expanding and disjunct; whorl profile sub-rounded with sub-angular ridges running from apex to aperture, variably developed; whorl section generally sub-circular; aperture sinuous, irregular and variable; sculpture composed only of growth lines, concave toward the aperture on the ridges and convex toward the aperture between the ridges.

**Dimensions:**

|                | Ht  | Wt  | Wh |
|----------------|-----|-----|----|
| M.U.G.D. 2173a | 4.3 | 7.6 | 2  |
| M.U.G.D. 2174  | 3.5 | 7.2 | —  |

**Location of Types:** Melbourne University Geology Department. Holotype, M.U.G.D. 2173a and b. Paratype, M.U.G.D. 2174.

**Type Locality:** Toongabbie Limestone, lower quarry, Marble Creek.

**Material:** Holotype and paratype.

**Discussion:** Besides being much smaller than the type species, *P. (P.) decorum* does not possess the typical capuliform shape because of its slower whorl expansion rate. Accordingly, the aperture of *P. (P.) decorum* is much smaller than that of the type species. The Marble Creek form also possesses distinct longitudinal ridges which are completely absent on the type species. The aperture of *P. (P.)*

*decorum* is much more sinuous and irregular than that of *P. (P.) vetustum*.

The distinctive sinuous, almost crenulated aperture of *P. (P.) decorum* is also a feature of the species of the subgenus *Platyceras* (*Orthonychia*) occurring at Marble Creek. These are all substantially larger than *P. (P.) decorum* and do not possess its initial coiling. However, the great variability of this genus and in cases only arbitrary distinctions between subgenera means that *P. (P.) decorum* and *P. (O.) marblecreekense* may in fact be the same species.

***Platyceras* (*Platyceras*) *minutum* Chapman, 1916**

(Plate 7, figure 8)

1916 *Platyceras minutum* Chapman, p. 97, pl. 5, fig. 41, pl. 6, figs. 57-58.

**Diagnosis:** Small, regularly coiled, horn-shaped form with regular growth lines.

**Description:** Small, horn-shaped gastropod of 2-3 whorls; shell rapidly expanding; body whorl disjunct; whorl section sub-ovoid; from sutures whorl profile gently rounded to nearly flat, becoming well-rounded at the mid-whorl periphery; aperture ovoidal; outer lip from both sutures strongly prosoclyt to the mid-whorl periphery; a broad open sinus formed at the mid-whorl; inner lip strongly curved; both lips thin; sculpture composed of prominent strong costae developed reasonably regularly; numerous finer growth lines between the costae.

**Dimensions:**

|        | Ht  | Wt  | Wh |
|--------|-----|-----|----|
| P12853 | —   | 4.8 | 3  |
| P41713 | —   | 5.3 | 3  |
| P41714 | —   | 5.2 | 3  |
| P41716 | 2.2 | 4.5 | 2  |

**Location of Types:** National Museum of Victoria. Holotype, P12853. Paratype, P12854. Hypotype, P41713, A. W. Cresswell Collection.  
**Type Locality:** Deep Creek.

**Material:** Holotype, hypotype and three other specimens.

**Discussion:** The small number of specimens limits the comparisons that can be made between this species and *P. (P.) vetustum*.

*P. (P.) minutum* is smaller and is coiled more regularly than the capuliform type species. The growth lines of *P. (P.) vetustum* are much more irregular than those of *P. (P.) minutum*.

*P. (P.) minutum* differs considerably from *P. (P.) decorum* occurring at Marble Creek. It is very much smaller and lacks the distinctive ridges of the latter form. Nor does it possess the distinctive irregular crenulated aperture of *P. (P.) decorum*. It also expands more rapidly and more regularly than the Marble Creek form.

The species from Deep Creek is very similar to the initial growth stages of the Devonian *P. (Platyceras)* sp. from Canada, figured by Bowsher (1955, pl. 2, fig. 1) attached to the crinoid *Arthroacantha carpenteri* Hinde. Both are of similar size and possess the same distinctive simple sculpture and apertural shape. However, with growth the Canadian form develops the irregular and variable growth lines that are typical of the subgenus.

Chapman (1916) considered that this species resembled the initial growth stages of a variety of *P. cornutum* (Hisinger). As figured by Hisinger (1828, pl. 6, fig. 6), (1837, pl. 12, fig. 11), and Lindström (1884, pl. 2, figs. 29-51, pl. 3, figs. 6-9, 19-26) no specimen is comparable with the Deep Creek form. None of the specimens figured by these authors possesses such pronounced and regular growth lines as does *P. (P.) minutum* or the Canadian form. Nor in general do the figured specimens cited by Chapman lack spiral sculpture as does *P. (P.) minutum*.

***Platyceras (Platyceras) mansfieldense* sp. nov.**

(Plate 7, figure 11)

1916 *Platyceras cornutum* (Hisinger); Chapman, p. 97, pl. 5, fig. 42.

**Diagnosis:** Large capuliform gastropod lacking sculpture except for fine irregular foliaceous growth lines and irregular rugae.

**Description:** Medium to large, irregularly capuliform gastropod of one or two whorls, first whorl coiled discoidally and in contact; last whorl rapidly expanding and disjunct; whorl profile sub-rounded; last whorl section sub-ovate; aperture sinuous, irregular and variable;

lips of variable thickness; sculpture lacking except for exceedingly fine irregular foliaceous growth lines and irregular rugae.

**Dimensions:**

|        | Ht  | Wt  | Wh |
|--------|-----|-----|----|
| P12855 | 24* | 32* | 1+ |
| P40344 | 37* | 37* | 1+ |

**Location of Types:** National Museum of Victoria. Holotype, P12855.

**Type Locality:** Loyola Limestone, Loyola.

**Material:** Holotype and two other specimens.

**Discussion:** Chapman (1916) considered that the Loyola species was the same as the intermediate, neritoid, depressed spire form of the Silurian *P. (P.) cornutum* (Hisinger) from Gotland, Sweden.

Originally figured by Hisinger (1828, pl. 6, fig. 6) as *Turbinites* sp., this species is totally different from the Loyola form. Similarly, the figure of *Pileopsis cornuta* Hisinger (1837, pl. 12, fig. 11) differs significantly from the Loyola form. Lindström (1884) redescribed *Platyceras cornutum* (Hisinger) and synonymized with it a great range of forms of varying ages from Europe. None of the forms which he figured are comparable in terms of both general shape and sculpture with the Loyola species.

Although the subgenera and species of this genus exhibit considerable morphological variation and are known to be intergrading, it is considered that the Loyola form is quite distinct from the Silurian *P. cornutum* occurring in Europe.

***Platyceras (Platyceras)* sp. A.**

**Description:** Medium, irregularly capuliform gastropod with rapidly expanding whorls; large last whorl; low spired; whorl profile changes with growth; from sutures whorl profile gently rounded at the mid-whorl periphery; with growth mid-whorl periphery weakens considerably; whorl section changes from being sub-ovoid to sub-circular with growth; aperture sinuous, slightly irregular; sculpture consists of fine slightly irregular foliaceous growth lines; tendency for occasional growth rugae to develop later.

*Dimensions:*

|        | Ht   | Wt   | Wh |
|--------|------|------|----|
| P44067 | 20.4 | 25.5 | 1+ |

*Location of Types:* National Museum of Victoria. Mentioned specimen, P44067.

*Type Locality:* Toongabbie Limestone, Marble Creek.

*Discussion:* This species is readily distinguishable from the other species of the subgenus *P. (Platyceras)* found at any of the limestone deposits discussed here. It is significantly larger than either *P. (P.) decorum* or *P. (P.) minutum* although both have a comparable number of whorls. Both these smaller forms appear to have growth sequences which differ from this species. The only other member of the subgenus, *P. (P.) mansfieldense*, is distinguishable by its considerably larger size, fewer whorls and different style of growth.

Again the lack of specimens prevents a satisfactory taxonomic assignment of the form or comparison with *P. (P.) vetustum*. Certainly the type species has a much more regular pattern of growth, more rapid whorl expansion and more explanate aperture than this species from Marble Creek.

Subgenus *Platyceras (Visitor)* Perner, 1911

*Type Species:* *Visitor extraneus* Perner, 1911; Silurian; Dvorce, Bohemia.

*Discussion:* The genus *Cowwarrella* was erected by Talent and Philip (1956) and distinguished by having a near rectangular whorl section, simple nucleus, absence of sculpture except growth lines, and an outer lip with an anteriorly directed tongue-like projection. *Cowwarrella cylindrica* Talent and Philip, the type species and only member of the genus, was from the Toongabbie Limestone, lower quarry, Marble Creek.

Knight *et al.* (1960, p. 1240) subsequently synonymized this genus with the subgenus *P. (Visitor)*.

***Platyceras (Visitor) cylindricum*** (Talent and Philip), 1956  
(Plate 7, figure 2)

1956 *Cowwarrella cylindrica* Talent and Philip, p. 61, pl. 4, figs. 12-14.

*Diagnosis:* Small, umbilicate, subcylindrical gastropod with few whorls, low to depressed spire, canaliculate sutures and narrow elongate aperture.

*Description:* Small, umbilicate, subcylindrical gastropod with few whorls, short to depressed spire and subcylindrical last whorl; sutures deep, canaliculate; whorl profile nearly flat from upper suture to slightly obtuse shoulder, outer whorl surface flat to sub-angular basal margin, base rounded to nearly flat and near perpendicular to outer whorl surface; aperture narrow, elongate; columellar lip long, thin; parietal lip short and of the same thickness as columellar lip; moderately thin outer lip passes slightly forwards from the upper suture to the shoulder, on the outer surface it arches further forwards to mid-whorl so forming a distinct deep sinus near the upper suture; below mid-whorl the lip passes backwards to just above the basal margin, from this point continues backwards much more strongly before turning forwards midway across the base and continuing into the umbilicus; the second lower sinus so formed is smaller but proportionally deeper than the upper sinus; growth lines of varying size are well developed; sculpture possibly variably present, composed of very widely spaced spiral ridges on the outer whorl surface.

*Dimensions:*

|               | Ht   | Wt   | Hap  | Wap | Wh |
|---------------|------|------|------|-----|----|
| M.U.G.D. 2169 | 12.9 | 10.8 | —    | —   | 3+ |
| M.U.G.D. 2280 | 10.6 | 9.2  | 10.1 | 2.9 | 3  |
| M.U.G.D. 2281 | —    | 6.4  | —    | 1.9 | 3  |

*Location of Types:* Melbourne University Geology Department. Holotype, M.U.G.D. 2169. Paratypes, M.U.G.D. 2280-2281.

*Type Locality:* Toongabbie Limestone, lower quarry, Marble Creek.

*Distribution:* Toongabbie Limestone and Deep Creek Limestone.

*Material:* Holotype, 2 paratypes, and 4 other specimens.

*Discussion:* *P. (V.) cylindricum* differs significantly from the type species. The form from Marble Creek is small and has a distinctive sub-cylindrical shape, whereas the type species is large and naticiform. Accordingly, the aper-



ture of *P. (V.) cylindricum* is narrow and elongate while that of *P. (V.) extraneum* is sub-ovoidal. Knight (1941) considered the type species to be 'seemingly anomphalous'. *P. (V.) cylindricum* has an umbilicus. The presence of this species at Deep Creek has not been previously reported.

Subgenus *Platyceras* (*Orthonychia*) Hall, 1843  
*Type Species: Platyceras (Orthonychia) sub-rectum* Hall, 1859; Devonian; near Williams-ville, Erie County, New York, U.S.A.

***Platyceras (Orthonychia) marblecreekense***

Talent and Philip, 1956

(Plate 7, figures 10, 12)

- 1956 *Orthonychia marblecreekensis* Talent and Philip, p. 65, pl. 7, fig. 22.  
 1956 *Platyceras trirotundolobatum* Talent and Philip, p. 64, pl. 7, figs. 26-27.  
 1956 *Orthonychia pentalvea* Talent and Philip, p. 65, pl. 7, figs. 28-29.

**Diagnosis:** Medium, variable horn-shaped form with up to 5 variably developed longitudinal ridges running from the apex to aperture.

**Description:** Medium, horn-shaped, uncoiled gastropod with up to 5 variable longitudinal ridges running from apex to aperture; shape irregular; initial region of the shell curved inwards; shell rapidly expanding; whorl section irregularly polygonal to sub-ovoidal; apertural margin irregular with a tendency to have a crenulated appearance; lips thin; sculpture absent except for longitudinal ridges and growth lines; growth lines variable, ranging from moderately regular fine lines which are convex towards the aperture between the longitudinal ridges and concave towards the aperture on the ridges, to coarse growth rugae which although irregular are not sigmoidal or crenulated.

**Dimensions:**

|               | Ht   | Wt    | Hap  | Wap  | Wh |
|---------------|------|-------|------|------|----|
| M.U.G.D. 2171 | 14.2 | 22.1  | —    | 16.9 | 1  |
| M.U.G.D. 2168 | 20.1 | 29.0* | —    | —    | 1  |
| M.U.G.D. 2170 | 18.5 | 30.7  | 18.5 | 17.7 | 1  |

**Location of Types:** Melbourne University Geology Department.

- (i) *Orthonychia marblecreekensis*. Holotype, M.U.G.D. 2171.

- (ii) *Platyceras trirotundolobatum*. Holotype, M.U.G.D. 2168.

- (iii) *Orthonychia pentalvea*. Holotype, M.U.G.D. 2170.

**Type Locality:** Toongabbie Limestone, lower quarry, Marble Creek.

**Material:** Holotype and 2 hypotypes.

**Discussion:** As the holotype of *P. trirotundolobatum* lacks the apical region of its shell, a critical feature in the present classification of subgenera of the genus *Platyceras*, the former name has not been selected as the senior synonym. The holotype of *O. marblecreekensis*, which name has page priority over *O. pentalvea*, is complete, and the former is accepted as the name for this taxon.

The three species of the two subgenera synonymized here are all uncommon, being represented by only one specimen each. All come from the same locality. The known mode of life of members of these subgenera and the influence such a life has upon individual shell morphology does not warrant the erection of three separate taxa for three individuals from the same locality.

The assignment of one form to the subgenus *Platyceras* is unjustified in view of its close similarity to the species of *Orthonychia* from the same locality and the absence of the apical region of the shell, the critical region in distinguishing between these two subgenera. As preserved there is no suggestion that the apical region of this shell was coiled.

All the specimens in this collection are considered to belong to a single species. This species is characterized by its medium size, uncoiled horn shape and the presence of about 5 variably developed longitudinal ridges. Otherwise there is considerable variation, particularly in the strength of the longitudinal ridges and the nature of the sculpture. These differences are distinguished by the establishment of 3 variants within the species.

- (i) Variant 1 (as represented by the holotype, M.U.G.D. 2171).

This variant possesses the weakest development of the longitudinal ridges. In some instances these ridges are not continuous from the apex to the aperture. The ridges tend to be

more strongly developed in the apertural region. The sculpture is exceedingly variable. Initially fine crenulated growth lines are present. This type of growth line is replaced rapidly by coarse growth rugae which are roughly straight rather than crenulated.

(ii) Variant 2 (as represented by hypotype M.U.G.D. 2170).

This more elongate variant is distinguished by a decidedly more curved but totally disjunct apical region. It also possesses fine, moderately uniform, growth lines which are typically crenulated. The longitudinal ribs are continuous from the apical region to the aperture.

(iii) Variant 3 (as represented by hypotype M.U.G.D. 2168).

This variant is distinguished by the height of the longitudinal ribs, which extend from the apical region to the aperture. The growth lines are typically crenulated.

### **Platyceras (Orthonychia) sp. A.**

(Plate 7, figure 7)

**Description:** Medium, irregularly capuliform gastropod with one and a half whorls; disjunct whorls expand rapidly; whorl profile probably sub-rounded; last whorl section sub-circular; sculpture where preserved composed of moderately irregular growth lines; aperture slightly irregular.

#### **Dimensions:**

|       | Ht   | Wt    | Wh |
|-------|------|-------|----|
| P1082 | 14.5 | 24.0* | 1+ |

**Location of Types:** National Museum of Victoria. Figured specimen, P1082 ex G.S.V. Collection, 91F.

**Type Locality:** Toongabbie Limestone, Marble Creek.

**Material:** Figured specimen on which the external sculpture is poorly preserved.

**Discussion:** This specimen provides an example of the often arbitrary distinction between the subgenera *P. (Platyceras)* and *P. (Orthonychia)*. Although having  $1\frac{1}{2}$  coils it is completely disjunct. The availability of more specimens may enable its taxonomic status to be determined satisfactorily. At present it is placed in the subgenus *Orthonychia* because of its disjunct

nature, minimal coiling and its great similarity with *P. (O.) marblecreekense*. This latter uncoiled species is characterized by the presence of variably developed longitudinal ridges and crenulated margin. Knight *et al.* (1960) considered that the apertural irregularities of the genus *Platyceras* were primarily a reflection of the host crinoid's characters rather than an inherent characteristic of the gastropod. Thus the apparent absence of a crenulate margin in *P. (Orthonychia)* sp. A. is not considered to be a significant taxonomic distinction between it and *P. (O.) marblecreekense*. At present these two species are differentiated on the basis of their coiling, general shape and the degree of development of the longitudinal ridges. However, further specimens may indicate that *P. (O.)* sp. A. is in fact another variant of *P. (O.) marblecreekense*.

*P. (Orthonychia)* sp. A. is similar to *P. (P.) mansfieldense* in general appearance and the nature of the growth lines. It differs in being much smaller, disjunct and having fewer whorls.

Subgenus *Platyceras (Praenatica)* Perner, 1903  
**Type Species:** *Strophostylus gregarius provea* Perner, 1903; Lower Devonian; Lockov, Bohemia.

### **Platyceras ? (Praenatica) sp. A.**

**Description:** Large explanate naticiform to auriform gastropod; body whorl greatly expanded; spire very low; sutures shallow; whorl profile changes with growth, becoming progressively more gently rounded; whorl periphery in lower half of whorl, initially strongly rounded, becomes less pronounced and more gently rounded with growth; inner lip and umbilical region unknown; aperture large; outer lip moderately thin and irregular; from the upper suture the outer lip strongly prosocytic; sculpture composed only of foliaceous growth lines; coarse growth lines near apex.

**Location of Types:** National Museum of Victoria. Mentioned specimen, P40348. Rev. R. Thomas Collection.

**Type Locality:** Loyola Limestone, Loyola.

**Material:** One crushed specimen.

**Discussion:** The lack of material limits com-



parison with the type species. Externally both species are very similar, although the *Loyola* species is slightly larger and has one more whorl. The absence of internal details precludes definite subgeneric placement.

**Platyceras** subgen. et sp. indet.

1956 *Orthonychia* sp. Talent and Philip, p. 66.

**Description:** Small explanate gastropod with gently rounded whorl profile; apical region missing; sculpture composed of collabral lines only preserved in the remaining 'apical' region; outer lip thin; apertural margin apparently regular.

**Dimensions:**

|                | Ht   | Wt   | Hap  | Wap | Wh |
|----------------|------|------|------|-----|----|
| M.U.G.D. 2182a | 11.0 | 9.7* | 11.0 | 8.7 | 1  |

**Location of Types:** Melbourne University Geology Department. Mentioned specimen, M.U. G.D. 2182.

**Type Locality:** Toongabbie Limestone, upper quarry, Marble Creek.

**Material:** One specimen.

**Discussion:** Absence of the apical region precludes subgeneric determination. Although broken it is apparent that the apical region narrows rapidly and curves, suggesting that the shell may have been coiled. The regularity of the few growth lines and the segment of the aperture preserved distinguishes it from all members of the subgenus *P.* (*Orthonychia*) from Marble Creek.

? **Platyceras** subgen. et sp. indet.

1956 *Platyceras* sp. Talent and Philip, p. 65.

**Description:** Small irregularly capuliform platyceratid gastropod; rapidly expanding last whorl.

**Dimensions:**

|               | Ht  | Wt   | Hap | Wap | Wh |
|---------------|-----|------|-----|-----|----|
| M.U.G.D. 2181 | 7.7 | 10.4 | 7.7 | —   | 1  |

**Location of Types:** Melbourne University Geology Department. Mentioned specimen, M.U. G.D. 2181.

**Type Locality:** Toongabbie Limestone, upper quarry, Marble Creek.

**Material:** One specimen.

**Discussion:** The single specimen is poorly pre-

served, lacking both its nucleus and sculpture. If the initial whorls were in contact, this specimen would possess a distinctly capuliform shape which would distinguish it from *P.* (*P.*) *decorum* from Marble Creek, the only species of approximately similar size.

Family **ORIOSTOMATIDAE** Wenz, 1938

Genus *Oriostoma* Munier-Chalmas, 1876

**Type Species:** *Oriostoma barrandei* Munier-Chalmas, 1876; Lower Devonian; Bois Roux quarry at Gahard, near Rennes, France.

**Oriostoma** n. sp.

(Plate 7, figure 3)

**Description:** Small, low spired, discoidal gastropod with few whorls; whorls increasing in size rapidly; body whorl large; whorl profile well rounded, from upper suture arched upwards to rounded shoulder, then arched gently to the round keel which surrounds the moderately wide umbilicus, then curved more tightly into the umbilicus; periphery at or below mid-whorl; inner and outer lip thin; outer lip weakly prosocline, retroussé at each of the major spiral sculptural elements; sculpture consists of two orders of numerous strong spiral elements; collabral growth lines range from moderately fine to foliaceous and are retroussé at the intersection with each of the major spiral elements.

**Dimensions:**

|        | Ht | Wt   | Wh |
|--------|----|------|----|
| P40319 | —  | 5.4  | 3  |
| P41727 | —  | 11.6 | —  |

**Location of Types:** National Museum of Victoria. Figured specimen P41728, A. W. Cresswell Collection.

**Locality:** P40319, Middle Crossing, Deep Creek. P41727 and P41728, Deep Creek.

**Material:** Figured specimen and two other specimens.

**Discussion:** This species differs from *O. barrandei* principally in possessing many more elements of spiral sculpture which are also more strongly developed. In this respect alone it resembles the sculpture of *Beraunia bifrons* (Perner). However, it is considerably smaller

than this species which is not a large member of the genus *Beraunia*. Because the spiral elements are more closely spaced in the form from Deep Creek, the posterior deflection of the collabral growth lines at their intersection with the spiral elements is markedly less than that occurring in the type species.

The Deep Creek form also differs from the type species in being smaller and having a more rounded whorl profile. *O. rotundimuratus* Tassell from the Lilydale Limestone is very similar to the Deep Creek form. However, the Lilydale species is slightly more turbinate and has fewer, more widely spaced and less strongly developed spiral sculptural elements.

Talent (1963) described and figured *Oriostoma* sp. from his locality 35 in the Kilgower Member of the Tabberabbera Formation. The two specimens he found were poorly preserved and considerably smaller than the form from Deep Creek. Both species appear to have a comparable number of spiral elements. However, *Oriostoma* sp. from the Kilgower Member lacks growth lines, so further comparison is limited.

Until more complete material is available from Deep Creek I will not name this species.

Family MURCHISONIIDAE Koken, 1896

Genus *Michelia* Roemer, 1852

Type Species: *Michelia cylindrica* Roemer, 1852; Devonian; Bockswiese, near Clausthal, Germany.

#### *Michelia* sp.

1907 *Niso* (*Vetotuba*) *brazieri* Chapman non Etheridge, pp. 73 and 79.

1913 *Vetotuba brazieri* Etheridge; Chapman, p. 227 (in part).

1916 *Coelocaulus brazieri* (Etheridge); Chapman, p. 86 (in part).

1956 *Coelocaulus* sp. Talent and Philip, p. 62, pl. 7, fig. 8.

**Description:** Small to medium, narrowly umbilicate, cyrtocoid gastropod; numerous whorls with profile gently convex between shallow impressed sutures; periphery about mid-whorl; apertural region unknown; pseudoselenizone present on lower half of whorl; sculpture unknown.

#### Dimensions:

|               | Ht   | Wt   | Wh |
|---------------|------|------|----|
| M.U.G.D. 2172 | 25.8 | 8.6  | 8+ |
| M.U.G.D. 2177 | 12.8 | 4.8  | 5  |
| P38510        | 29*  | 10.0 | 9  |

**Location of Types:** Melbourne University Geology Department. Figured specimen, M.U.G.D. 2172.

**Type Locality:** Toongabbie Limestone, upper quarry, Marble Creek.

**Material:** Figured specimen and 2 other specimens. All material is poorly preserved.

**Discussion:** Comparison of this material with the two better known species *M. brazieri* (Etheridge) from Lilydale and *M. darwini* (de Koninck) from Taemas is difficult because of its very poor preservation. The specimens from Marble Creek are considerably smaller than either of the other two species.

Chapman (1907) noted the presence of *Niso* (*Vetotuba*) *brazieri* at Marble Creek. This specimen (P38510) is very poorly preserved. The apertural region is not preserved nor is the columella visible. There is a suggestion of a pseudoselenizone on the lower half of the last whorl. The disconcerting feature about this specimen is the rather more rapid expansion of whorl diameter compared to whorl height than is typical of either the other two specimens from Marble Creek or the other two species. Assignment of this specimen to this genus is at best tentative.

Family PSEUDOPHORIDAE S.A. Miller, 1889

Genus *Scalaetrochus* Etheridge, 1890

Type Species: *Trochus* (*Scalaetrochus*) *lindstroemi* Etheridge, 1890; Lower Devonian; Lilydale Limestone quarry, Lilydale, Victoria.

#### *Scalaetrochus lindstroemi* Etheridge, 1890

**Description:** Large trochiform gastropod with mildly concave base; irregular sutures flush to slightly protruding; whorl profile gently convex; periphery angular forming frill; peripheral region thickened by callus deposit; thickened outer lip moderately prosocline from upper suture to the basal periphery, continues obliquely across the base; umbilical region unknown;

collabral growth lines, fine to slightly foliaceous on the outer whorl surface; collabral lines on the base fine.

*Dimensions:*

|        | Ht  | Wt | Wh |
|--------|-----|----|----|
| P40349 | 28* | 34 | 6  |

*Location of Types:* National Museum of Victoria. Mentioned specimen, P40349. G. Sweet Collection.

*Type Locality:* Lilydale Limestone, Lilydale.

*Distribution:* Lilydale Limestone and Loyola Limestone.

*Material:* Mentioned specimen.

*Discussion:* Although only one specimen has been found at Loyola, it is sufficiently well preserved for it to be assigned to this species. Its presence there extends the known occurrence of this species. Chapman (1907, p. 73) mentioned the presence of a fragment of *Trochus* (*Scalaetrochus*) sp. at Marble Creek; as yet this specimen has not been relocated and his identification confirmed.

Turbiniiform gastropod gen. et sp. indet.

*Description:* Small turbiniiform gastropod of at least 3 whorls; last whorl slightly expanded; whorl profile gently arched between sutures, becoming more strongly arched onto the base; base arched; umbilicus probably present; sutures shallow, impressed; inner lip unknown; outerlip moderately thin, other details of outer lip unknown; aperture probably ovoidal.

*Dimensions:*

|        | Ht   | Wt  | Wh |
|--------|------|-----|----|
| P41729 | 5.4* | 5.2 | 3+ |

*Location of Types:* National Museum of Victoria. Mentioned specimen, P41729. A. W. Cresswell Collection.

*Type Locality:* Deep Creek.

*Material:* Mentioned specimen.

*Discussion:* The single specimen does not show growth lines on the small fragments of the outer shell present. Thus assignment to a genus is impossible. However, its mode of coiling distinguishes it from all the other gastropods discussed.

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### Explanation of Plate

#### PLATE 7

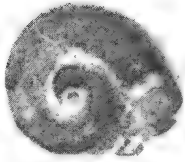
- Figure 1—? *Temnodiscus pharetroides* Chapman, P12835, holotype, X1.  
 Figure 2—*Platyceras (Visitor) cylindricum* (Talent and Philip), M.U.G.D. 2169, holotype, X2. Apical view.  
 Figure 3—*Oriostoma* n. sp., P41728, figured specimen, X1½. Apical view.  
 Figure 4—*Platyceras (Platyostoma) triangulare* Talent and Philip, M.U.G.D. 2175, holotype, X1½. Apical view.

- Figure 5—*Tropidodiscus centrifugalis* (Chapman), P12844, holotype, X1½ approx.  
 Figure 6—*Platyceras (Platyostoma) incisum* Chapman, M.U.G.D. 2164, hypotype, X1½. Apical view.  
 Figure 7—*Platyceras (Orthonychia)* sp. A., P1082, figured specimen, X2 approx.  
 Figure 8—*Platyceras (Platyceras) minutum* Chapman, P41713, hypotype, X3.  
 Figure 9—*Tremanotus cyclocostatus* Talent and Philip, M.U.G.D. 5031, hypotype, X2 approx.  
 Figure 10—*Platyceras (Orthonychia) marblecreekense* Talent and Philip, M.U.G.D. 2171, holotype, X2 approx.  
 Figure 11—*Platyceras (Platyceras) mansfieldense* sp. nov., P12855, holotype, X1½ approx.  
 Figure 12—*Platyceras (Orthonychia) marblecreekense* Talent and Philip, M.U.G.D. 2170, hypotype, X1½ approx.  
 Figure 13—*Tremanotus cyclocostatus* Talent and Philip, M.U.G.D. 5031, hypotype, X2 approx.  
 Figure 14—*Platyceras (Platyostoma) incisum* Chapman, P1083, holotype, X1.

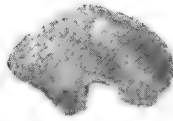




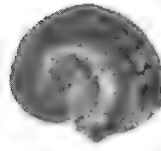
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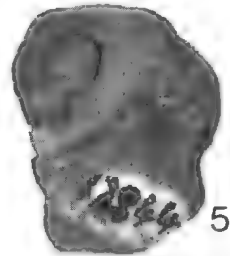
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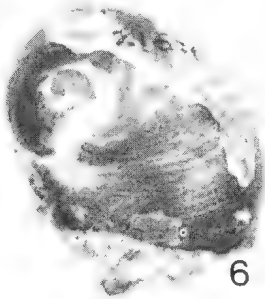
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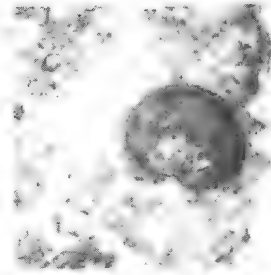
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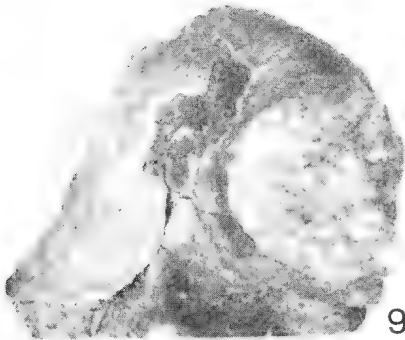
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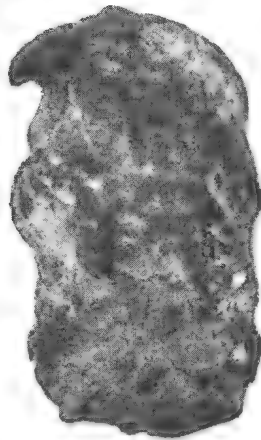
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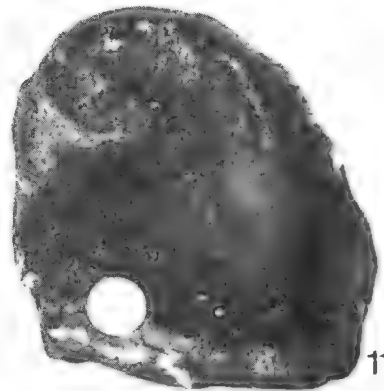
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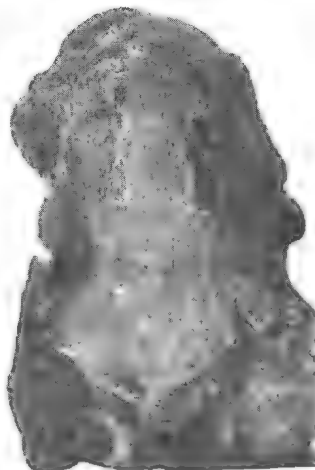
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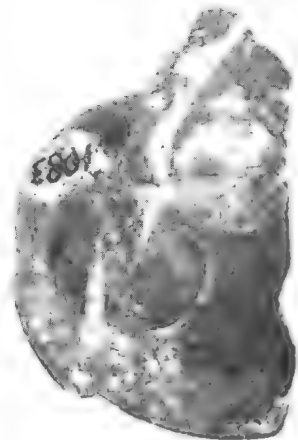
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14



# A NEW OWLET-NIGHTJAR FROM THE EARLY TO MID-MIOCENE OF EASTERN NEW SOUTH WALES

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## Abstract

A new owlet-nightjar (Family: Aegothelidae), *Quipollornis koniberi* gen. et sp. nov., has been recognized from Miocene lacustrine sediments in eastern New South Wales. It thus establishes the occurrence of the aegothelids in Australia during the Miocene. The new form shows distinct and numerous differences from the other two genera in this family, the living *Aegotheles* from Australia, New Guinea, and the South-west Pacific and its closely related New Zealand counterpart, *Megaegotheles*, now extinct.

## Introduction

During the past 50 years diatomite deposits representing mid-Tertiary freshwater lakes in eastern Australia have yielded a number of well-preserved leaves and fish. Among these collections is a single, unique skeleton of a small bird closely related to the living Owlet-nightjars (*Aegotheles*), nocturnal birds endemic to, but with wide dispersion in, Australia, New Guinea, and the South-west Pacific. The Miocene fossil, *Quipollornis koniberi* gen. et sp. nov., is the oldest record of the family Aegothelidae, which is represented by only one other genus, the extinct *Megaegotheles* (Scarlett, 1968; Rich and Scarlett, 1977) from the Quaternary of New Zealand. This paper describes the new form and compares it with all other caprimuliform families.

In this study the following forms were available to us for comparison: *Steatornis caripensis* (1), *Nyctibius griseus* (3), *Podargus strigoides* (20), *Aegotheles cristatus* (9), *Eurostopodus guttatus* (5), *E. mysticallis* (3), and *Chordeiles minor* (1).

## Systematics

Class: Aves

Order: Caprimulgiformes (Ridgway) Brodkorb, 1971

Family: Aegothelidae (Bonaparte)

**Comment:** Placement of *Quipollornis koniberi* gen. et sp. nov. in the Aegothelidae is based primarily on its broad skull with slender-boned lower and upper jaws and rounded, inflated braincase; its highly curved internal margin of

the coracoidal head; and its short but broad cervical vertebrae. This combination of characters appears to be unique to the Owlet-nightjars within the Caprimulgiformes.

## *Quipollornis* gen. nov.

**Type Species:** *Quipollornis koniberi* gen. et sp. nov.

**Age and Distribution:** Early to Middle Miocene, eastern New South Wales, Australia.

**Etymology:** Quipolly (Aboriginal), a water-hole containing fish; *ornis* (Greek), Bird. Referring to the occurrence of *Quipollornis* in lacustrine sediments containing mainly fish.

**Diagnosis:** Differs from *Aegotheles* in that the jugals are broader and stouter bones, and the maxillaries do not expand as much medio-laterally towards their posterior termination. Differs from both *Aegotheles* and *Megaegotheles* in that the head of coracoid is not as inflated dorsally and is decidedly more elongate between the coraco-humeral surface and procoracoid; the scapula appears to lack a marked flexure near the posterior end as well as expansion of the posterior end present in *Megaegotheles*; the breadth of the scapula just anterior to the glenoid facet is somewhat greater than in *Aegotheles*, similar to that area in *Megaegotheles*; the deltoid crest is intermediate in its dorso-lateral protrusion between *Megaegotheles* and *Aegotheles*; the metacarpal I process is lower and broader, and metacarpal III markedly more robust. Differs from *Megaegotheles* in that the shaft (viewed ventro-laterally) is not as highly curved.

Ratios (see Table 1). The humerus about twice the length of femur unlike that of



TABLE 1: Measurements (in mm.) of Skull, Shoulder Girdle, and Limbs  
of *Quipollornis koniberi*, n. gen. et n. sp. and Other Caprimulgiforms.

| Specimens<br>Measurements                               | <i>Podargus<br/>strigoides</i> | <i>Eurostopodus<br/>mystacalis</i> | <i>Eurostopodus<br/>guttatus</i> | <i>Aegotheles<br/>cristatus</i> | <i>Steatornis<br/>caripensis</i> | <i>Nyctibius<br/>griseus</i> | <i>Quipollornis<br/>koniberi</i><br>AMF49404-5 | <i>Megaegotheles<br/>novaeseelandiae</i> |
|---|--------------------------------|------------------------------------|----------------------------------|---------------------------------|----------------------------------|------------------------------|--|--|
|   |                                |                                    |                                  |                                 |                                  |                              | rt. lf.  |  |
| Skull   |                                |                                    |                                  |                                 |                                  |                              |  |  |
| Width   | 49.3-55.4 (6)                  | 30.0                               | 24.8 (1)                         | 22.8-23.6                       | 34.4                             | 43.1-47.2                    | 30.8   | 26.0-27.0                                |
| Length  | 81.5-88.7                      | 52.6                               | 44.0-48.4 <sup>4</sup>           | 35.4-38.4                       | 60.1                             | 56.8-65.1                    | 40.8   | -  |
| Width/Length  | 0.58-0.68                      | 0.57                               | 0.51                             | 0.61-0.65                       | 0.57                             | 0.73-0.76                    | 0.75   | -  |
| n   | 7 (6)                          | 1                                  | 2 (1)                            | 6                               | 1                                | 3                            | 1  | 2  |
| Scapula   |                                |                                    |                                  |                                 |                                  |                              |  |  |
| Length  | 38.2-43.7                      | 32.8-34.4                          | 26.4-27.9                        | 19.0-23.4                       | 46.2                             | 34.9-39.2                    | 21.2   | 23.3                                     |
| Maximum width, head                                     | 9.6- 11.3                      | 5.3- 6.7                           | 4.8- 5.6                         | 4.2- 5.1                        | 8.8                              | 7.4- 7.5                     | 5.3  | 5.6                                      |
| n   | 8                              | 3                                  | 3                                | 8                               | 1                                | 3                            | 1  | 1  |
| Coracoid  |                                |                                    |                                  |                                 |                                  |                              |  |  |
| Length of head <sup>1</sup>                             | 9.0- 9.5                       | 6.9- 7.7                           | 6.8                              | 4.2- 4.6                        | 6.4                              | 7.0- 9.2                     | 4.8  | 4.7                                      |
| Width across head <sup>2</sup>                          | 4.5- 5.5                       | 3.9- 5.7                           | 3.2                              | 1.3- 2.0                        | 7.4                              | 3.6- 5.3 (2)                 | 2.8  | 2.1                                      |
| n   | 3                              | 2                                  | 1                                | 7                               | 1                                | 3 (2)                        | 1  | 1  |
| Humerus   |                                |                                    |                                  |                                 |                                  |                              |  |  |
| Length  | 76.0- 81.7 (6)                 | 53.2-54.7                          | 43.5-47.2                        | 26.6-28.4                       | 69.2                             | 59.8-67.3                    | 35.0 <sup>4</sup>                              | 34.9                                     |
| Maximum width proximal end <sup>3</sup>                 | 17.4- 21.6                     | 12.9- 18.1                         | 12.9- 14.6                       | 8.1- 9.1                        | 20.9                             | 16.8-20.2                    | 10.0   | 11.2                                     |
| Maximum width distal end                                | 13.7- 14.6                     | 9.8- 10.1 (6)                      | 7.8- 8.4                         | 5.6- 6.2                        | 14.3                             | 10.7- 12.9                   | -  | 7.1                                      |
| n   | 7 (6)                          | 3                                  | 3                                | 7                               | 1                                | 3                            | 1  | 22 (20)                                  |
| Ulna  |                                |                                    |                                  |                                 |                                  |                              |  |  |
| Length  | 81.7- 96.8                     | 67.4-67.8                          | 57.4-63.0                        | 32.8-34.9                       | 103.2                            | 63.4-72.0                    | -  | 44.5 <sup>5</sup>                        |
| Maximum diameter, external condyle                      | 6.9- 7.4                       | 5.0- 5.8                           | 4.0- 4.5                         | 2.7- 3.1                        | 7.0                              | 5.8- 6.9                     | -  | 4.4                                      |
| n   | 8                              | 3                                  | 3                                | 8                               | 1                                | 3                            | 1  | 3.3- 3.4 (3)                             |
| Carpometacarpus   |                                |                                    |                                  |                                 |                                  |                              |  |  |
| Length from head to distal end of intermetacarpal space | 32.0-36.6                      | 30.6-31.3                          | 27.7-29.1                        | 15.2- 16.7                      | 37.6                             | 24.9-31.1                    | -  | 19.8                                     |
| Minimum width of metacarpal II                          | 2.0- 2.5                       | 2.2- 2.3                           | 1.7- 1.8                         | 0.9- 1.2                        | 2.5                              | 2.4- 3.1                     | -  | 2.9                                      |
| Length of intermetacarpal space                         | 19.8-24.1                      | 21.2-21.8                          | 19.8-20.6                        | 9.4- 11.2                       | 22.7                             | 14.8- 18.6                   | -  | 11.6                                     |
| n   | 8                              | 3                                  | 3                                | 8                               | 1                                | 3                            | 1  | 11.4                                     |
| Carpal Phalanx I  |                                |                                    |                                  |                                 |                                  |                              |  |  |
| Length  | 8.6- 12.2                      | 10.6                               | 7.9                              | 5.6                             | 13.8                             | 10.1                         | -  | 5.6                                      |
| n   | 5                              | 1                                  | 1                                | 1                               | 1                                | 1                            | 1  | -  |
| Femur   |                                |                                    |                                  |                                 |                                  |                              |  |  |
| Length  | 40.2-43.1                      | 28.5-29.2                          | 24.2-26.1                        | 20.5-22.0                       | 35.1                             | 27.6                         | 17.5   | 23.0-32.0                                |
| n   | 8                              | 3                                  | 3                                | 8                               | 1                                | 2                            | 1  | 7  |
| Tibiotarsus   |                                |                                    |                                  |                                 |                                  |                              |  |  |
| Depth, proximal end                                     | 7.8- 8.8                       | 4.5- 5.4                           | 3.7- 4.1                         | 3.4- 4.3                        | 7.4                              | 5.0- 6.3                     | 4.6  | 5.7                                      |
| Length  | 62.4- 71.2                     | 38.6- 39.4                         | 34.0-38.4                        | 35.4- 38.0                      | 43.5                             | 35.6-42.1                    | 22.1   | 6.4- 6.5 (2)                             |
| n   | 8                              | 3                                  | 3                                | 7 (6)                           | 1                                | 3                            | 1  | 50.0- 66.0+ (2) (2)                      |
| Ratios  |                                |                                    |                                  |                                 |                                  |                              |  |  |
| Humeral Length / Ulnar Length                           | 0.84- 0.93                     | 0.78- 0.81                         | 0.74- 0.76                       | 0.78- 0.81                      | 0.67                             | 0.93- 0.96                   | -  | 0.78                                     |
| Humeral Length / Femoral Length                         | 1.76- 1.94                     | 1.82- 1.91                         | 1.80- 1.84                       | 1.26- 1.32                      | 1.97                             | 2.17- 2.22                   | 2.0  | 1.13- 1.23                               |
| Humeral Length / Skull Length                           | 0.92- 0.97                     | 1.04                               | 0.93- 0.99                       | 0.72- 0.76                      | 2.01                             | 1.02- 1.03                   | 1.14   | 1.09- 1.34                               |
| Humeral Length / Proximal Width Humerus                 | 3.70- 4.12                     | 3.01- 3.13                         | 3.17- 3.37                       | 2.92- 3.24                      | 3.31                             | 3.33- 3.65                   | 3.5  | 3.12                                     |
| Humeral Length / Distal Width Humerus                   | 5.54- 5.83                     | 5.16- 5.43                         | 5.36- 6.05                       | 4.39- 4.82                      | 4.84                             | 5.22- 5.74                   | -  | 4.92                                     |
|   |                                |                                    |                                  |                                 |                                  |                              |  | 5.19- 5.34                               |

## FOOT NOTES:

1. Length of coracoid from dorsalmost part of head to ventralmost part of curve between procoracoid and brachial tuberosity.
2. Width from distalmost extension of curve to external margin of shaft.
3. Width across head to maximum expansion of deltoid crest.

4. @, approximately,  $\approx$ , slightly greater or slightly less than.

5. Measurement made by utilizing complete humerus on counterpart to project where proximal end of ulna would occur on other slab.

6. Because none of the *Megaegotheles* except one where definitely associated, ratios have been computed by considering minimum measures together and maximum measures likewise.

*Megaegotheles* and *Aegotheles* where humerus and femur are nearly subequal; the humerus is slightly longer than the width of the skull as in *Megaegotheles*, but unlike *Aegotheles* in which the skull is broader than the length of humerus; humerus broader distally with respect to its length than that in *Megaegotheles*, although quite similar to that of *Aegotheles*.

**Comparisons:** Skull. The occipital region of cranium is rounded posteriorly (convex posteriorly) unlike the flattened posterior edge in *Eurostopodus* and *Caprimulgus*, the slightly concave edge in *Nyctibius*, and the slightly convex edge in *Podargus* and *Steatornis*; the dorsal surface of cranium lacks the well-developed, paired temporal fossae that occur in *Podargus* and *Steatornis*. Such fossae are only slightly developed in *Aegotheles*, are situated much more ventrally, and thus are not evident in dorsal view; the premaxillaries, maxillaries, and nasals are very slender as in *Aegotheles*, but unlike the fully fused elements in *Podargus* and *Steatornis* that form a completely enclosed and continuous upper jaw or the much exanded premaxillae and maxillae in *Eurostopodus* or the elongate and very slender premaxillae that merge into a broad, nearly continuous palate (except for a slender slit along the midline) in *Nyctibius*; the external nasal opening extends further forward than in all genera examined except *Aegotheles*; the upper jaws, viewed dorsally, rapidly expand posteriorly, closely resembling *Aegotheles*, but unlike the gradual expansion that occurs in *Eurostopodus*, *Caprimulgus*, *Chordeiles*, and *Steatornis* resulting in a narrow V-shaped skull or bill or in *Podargus* and *Nyctibius* that have a slightly broader V-shape. The skull is very broad proportionally, decidedly more so than in *Eurostopodus* and *Steatornis*, but closer to that of *Podargus*, *Aegotheles*, and *Nyctibius*. A delicate, short anterior nail is formed as in *Aegotheles*.

Vertebrae (see Table 2). All cervicals preserved are broad with respect to length. In what are probably cervicals 4 and 7 the breadth across anterior zygapophyses is greater than vertebral length; in *Podargus*, *Eurostopodus*, *Steatornis*, and *Nyctibius*, anterior width never

exceeds length on any of cervicals 3-6; in *Chordeiles*, width doesn't exceed length in cervicals 5-7; in *Aegotheles*, width and length are nearly the same in cervicals 3-7, with a resulting shorter neck than in most caprimulgi-forms in this form and in *Quipollornis*.

Scapula. The breadth of the scapula just anterior to the glenoid facet somewhat narrowed, intermediate between the narrow scapula of *Aegotheles* and the somewhat broader one of *Eurostopodus* and *Chordeiles* but decidedly narrower than that in *Podargus*, *Nyctibius*, and *Steatornis*; the lateral margin of the shaft is not highly curved as in *Steatornis* and *Nyctibius*. (The entire scapula is not preserved, but enough remains for the beginning of expansion to be evident if present; the left scapula, in fact, appears to be nearly complete.)

Coracoid. The medial margin of head between the brachial tuberosity and the procoracoid is highly curved with procoracoid extending so far dorsally that it leaves only a small gap between it and brachial tuberosity as in *Aegotheles*, and unlike the less highly curved margins and broader gaps characteristic of *Podargus*, *Eurostopodus*, *Chordeiles*, *Steatornis*, and *Nyctibius*.

Humerus. The bone is relatively more robust than in other caprimulgi-forms; angle formed between the shaft and proximal margin of bicipital crest is small obtuse angle as in *Steatornis*, *Nyctibius*, *Chordeiles*, and *Aegotheles*, but differs from *Podargus* and *Eurostopodus*; deltoid crest is not as prominent dorsally but is lower and gently rounded throughout, unlike that in *Aegotheles*, *Eurostopodus*, and *Chordeiles*; deltoid crest is also not as broadly expanded from the shaft as in *Steatornis*.

Radius-ulna. The distal end of radius is much more closely appressed to distal end of ulna than in *Steatornis*, *Nyctibius*, and *Chordeiles*.

Carpometacarpus. Differs from other caprimulgi-forms in that the process of metacarpal I appears to be lower and more rounded; angle formed between proximal margin of carpal trochlea (viewed externo-dorsally) and long axis of shaft is more acute; the bone is shorter and much more robust, and metacarpal III is

TABLE 2: Vertebral Measurements of *Quipollornis koniberi*, n. gen. et n. sp., and Other Caprimulgiforms (in millimeters).

| Specimen Measurements | <i>Podargus strigoides</i><br>NMV B 10178 | <i>Eurostopodus guttatus</i><br>NMV 10847 | <i>Aegotheles cristatus</i><br>NMV 11033 | <i>Steatornis caripensis</i><br>UCMVZ 141741 | <i>Nyctibius griseus</i><br>UCMVZ 126575 | <i>Quipollornis koniberi</i><br>AMF 49404-5 |
|-----------------------|---|---|--|--|--|---|
| Cervical 4            |   |   |  |  |  |   |
| Anterior width        | 8.3                                       | 5.0                                       | 5.0                                      | 7.2  | 7.1                                      |   |
| Posterior width       | 7.4                                       | 5.6                                       | @ 3.7                                    | 7.5  | 6.5                                      | 8.0   |
| Least width           | 5.0                                       | 5.6                                       | 2.0                                      | 4.2  | 6.3                                      |   |
| Left length           | 11.2                                      | 6.2                                       | 4.7                                      | 9.8  | 7.5                                      |   |
| Right length          | 11.2                                      | 6.2                                       | 4.7                                      | 9.6  | 7.6                                      | 6.7   |
| Cervical 7            |   |   |  |  |  |   |
| Anterior width        | 11.4                                      | 6.2                                       | 5.1                                      | 10.7   | 9.5                                      | 7.4   |
| Posterior width       | 9.1                                       | 4.6                                       | 3.6                                      | 8.8  | 6.2                                      | 7.4   |
| Least width           | 3.9                                       | 2.4                                       | 2.1                                      | 3.8  | 3.0                                      |   |
| Left length           | 10.5                                      | 7.8                                       | 4.2                                      | 9.6  | 7.4                                      | 5.4   |
| Right length          | 9.8                                       | 7.7                                       | 4.3                                      | 9.6  | 8.7                                      | 5.4   |

@ = approximately

relatively stouter with respect to metacarpal II. The ventral border is slightly more bowed than we observed in other caprimulgiforms.

Femur. When viewed laterally, the bone is parallel-sided over much of its length rather like all caprimulgiforms except *Steatornis* where shaft margins diverge towards either end of bone from central part of shaft.

Tibiotarsus. See comment, below.

Feather Impressions. Lateral to the region of the pectoral girdle and the cervical vertebrae are the impressions of contour feathers. These, however, do not show normal feather shape or structure. They preserve the appearance that can be achieved by wetting soft aegothelid contour feathers so that the barbs in each one cling to the rachis, and the feather then takes on a narrow, slender structure. This process is, of course, consistent with the mode of preservation of the fossil specimen. Viewed in this light, the feathers would appear to be typical of, but rather longer than, the soft contour feathers of the living *Aegotheles*. Because of the lack of detail on the fossil feathers, however, it would be fruitless to carry the comparison further, or to claim that the feathers are closer in morphology to *Aegotheles* than to a number of other birds.

*Comment:* Because only a dorsal view of the specimen has been preserved, ventral elements such as the sternum and more lateral ribs cannot be discerned. Dorsal elements, however, such as vertebrae are readily visible, at least in part.

Vertebrae preserved in *Quipollornis* exhibit a distinct constriction at the fore-aft midline. If cervicals 3 and 4 are represented in this series, their morphology differs from that in *Eurostopodus*, *Steatornis*, and *Nyctibius*, where no such constriction occurs, but is similar to that in *Aegotheles* and *Podargus*.

Besides the vertebrae, many of the elements discussed in the diagnosis are obscured so that interpretation is often difficult and tentative. The posterior ends of the scapulae are missing, and thus whether the scapula was curved near the end or not is unknown. Likewise, the ventral halves of the coracoids are not visible. The humeri are difficult to interpret because one cannot be certain of their precise orientation, and slight differences in perspective can produce apparent radical differences in shape of the deltoid crest and in the prominence of the external tuberosity along the margin between the head of the humerus and the deltoid crest. The proximal end of the carpometacarpus is somewhat obscured by the distal end of the ulna; similarly, the femora and proximal parts of the tibiotarsii are either lacking or obscured with bone hash to the extent that few qualitative statements can be made concerning those bones.

### *Quipollornis koniberi* sp. nov.

(Plate 8, fig. A-B)

*Holotype:* Australian Museum (AM) No. F49404 and F49405, partial flattened skeleton or its impression in diatomite, including part and counterpart blocks that partly overlap

Representation on these blocks comprises a complete, but partially obliterated skull, 4-6 cervical vertebrae that may represent cervicals 4-8 or 10, scapulae, a partial right and possibly part of the head of the left coracoid, humeri, partial radii and ulnae, the left carpometacarpus and alula, partial right and left femora and tibiotarsii, possibly the anterior part of the synsacrum, as well as a number of feather impressions that suggest feathers were wet when bird preserved, with barbs closely adhering to the rachis.

*Type Locality and Age:* Diatomaceous earth deposit at Chalk Mountain, Bugaldi, near Coonabarabran, Warrumbungle Mountains, eastern New South Wales; Early to Middle Miocene.

*Measurements:* See Tables 1 and 2.

*Etymology:* Koniberi (Aboriginal), name of tribe that once inhabited the geographic area from which *Quipollornis* was recovered.

*Diagnosis:* Same as for genus.

### Stratigraphic Position

Diatomite deposits from the Coonabarabran area in New South Wales have long been known to produce fossil leaves and fish (Kenny, 1924), the fish being studied some time ago (Hills, 1946) and found to be close to, if not conspecific with, the Murray Cod (*Maccullochella macquariensis*). The leaves, placed in the genus *Cinnamomum* (David, 1950), suggest the presence nearby of rainforest, but its extent is unknown.

Conveniently, the Warrumbungle volcanics also occur in this area and are known to overlie the diatomite deposits producing the fish and aegothelid (Dulhunty and McDougall, 1966; David, 1950). These volcanics have been dated using the potassium-argon technique and range in age from 13.5 to 17 million years B. P. (Dulhunty and McDougall, 1966; Wellman and McDougall, 1974). No vulcanism is known in eastern New South Wales younger than 10 million years ago, so a minimum date of mid-Miocene can be assigned to the Chalk Mountain deposits and their included fossils.

### Discussion and Conclusions

Upon first glance, the fossil bird skeleton preserved in the two diatomite blocks from Bugaldi appears to retain exquisite detail, but upon close perusal, it becomes evident that the only parts distinct enough for taxonomic use are the skull, the cervical vertebrae, part of the shoulder girdle and forelimb. Other bones in the skeleton do not contradict the assignment of this form to the Aegothelidae, but, likewise, do not provide any qualitative characters that can be used to distinguish *Quipollornis* from other members of the family.

Within the Aegothelidae, *Aegotheles* and *Megaegotheles* are very similar to one another (Scarlett, 1968; Rich and Scarlett, 1977) and together form a subunit that is distinct from *Quipollornis*. The main differences between the two groups are in relative size of the jugals, shape of the head of the coracoid, shape of the scapular shaft, shape of the metacarpal I process on the carpometacarpus, and the relative lengths of the humerus and femur. Because of the difference, the forelimb seems to have been decidedly more elongate in *Quipollornis* than in other aegothelids (see Table 1), characteristic of the non-aegothelid caprimulgiforms, and thus the marked emphasis placed on hind limbs in the Owlet-nightjar group had not as yet begun to develop significantly.

Despite such differences from the Pleistocene and living aegothelids, *Quipollornis* clearly belongs to this family, and establishes that many of the cranial specializations of the family had already developed some 20 million years ago. However, as mentioned above, emphasis on the hind limb at the expense of the wing had not begun, suggesting a primitive condition for *Quipollornis* within the aegothelids. Such lack of emphasis on the hind limb further suggests that *Quipollornis* was an aerial 'insectivore' like most caprimulgiforms rather than primarily a terrestrial forager, as are the Owlet-nightjars.

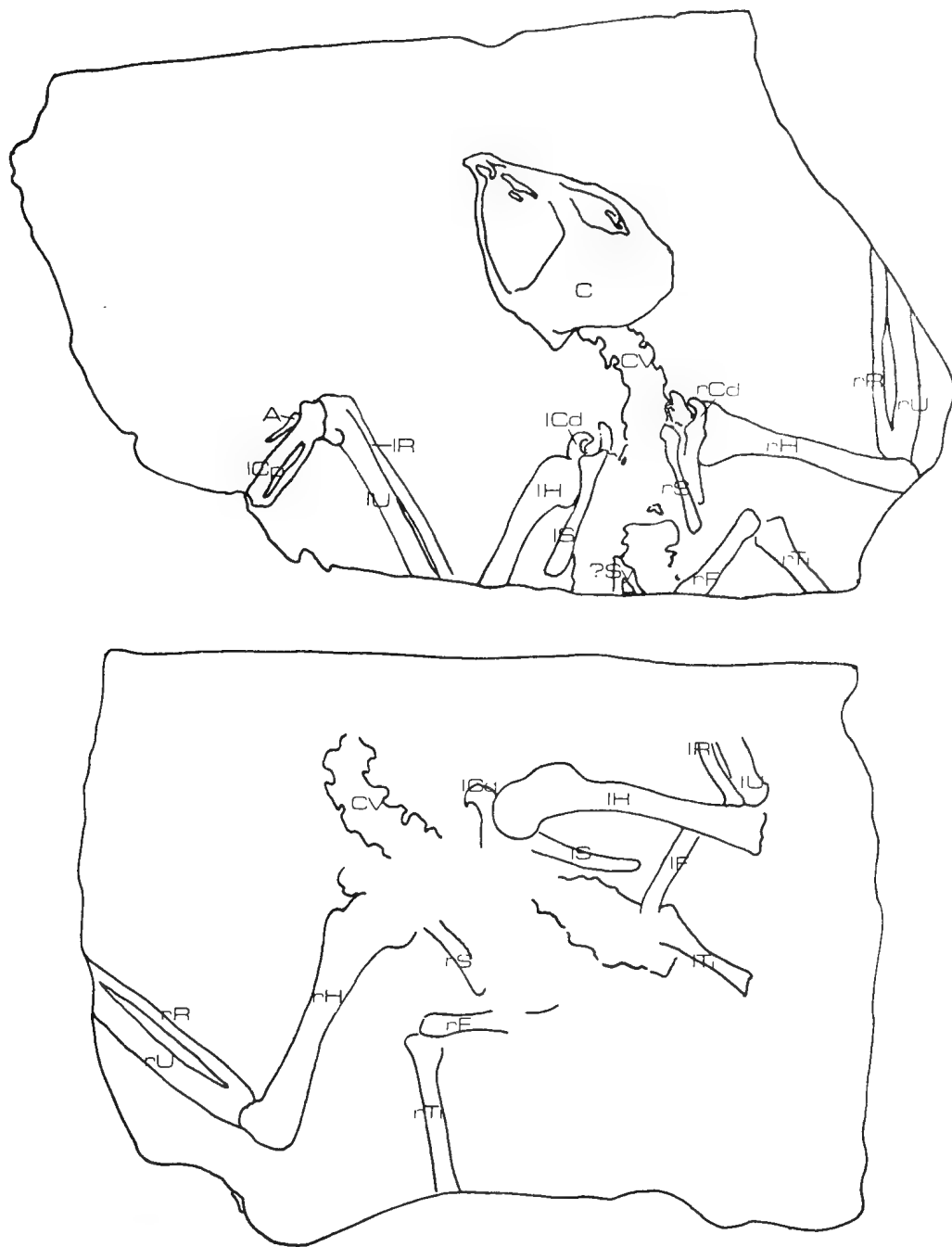
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graciously loaning us the specimen for study; Dr Ned K. Johnson (Museum of Vertebrate Zoology, University of California, Berkeley) for the loan of other modern caprimulgiforms used in comparison with the fossil form. Photographs are by Frank Coffa (National Museum of Victoria). The material was originally donated by F. W. Burton in 1961, and Harold Fletcher first recognized the avian affinities of the specimen. We are most indebted to the late Dr R. A. Stirton (formerly of the Department of Paleontology, University of California, Berkeley) for bringing this specimen to our attention. Mrs Lyn Anderson typed the manuscript. Mary Lee Vickers typed the tables.

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### Explanation of Plate 8

*Quipollornis koniberi* gen. et sp. nov. Abbreviations include: A, alula; C, cranium; CV, cervical vertebrae; lCd, left coracoid; lCp, left carpometacarpus; lF, left femur; lH, left humerus; lR, left radius; lS, left scapula; lTi, left tibiotarsus; lU, left ulna; rCd, right

coracoid; rF, right femur; rH, right humerus; rR, right radius; rS, right scapula; rTi, right tibiotarsus; rU, right ulna; ?Sy, possible synsacrum; Fig. A, AM F49404, block containing skull opposite counterpart; Fig. B, AM F49405, counterpart block, see scale for size. Fig. A printed at slightly smaller scale than Fig. B.





A



B





# FOLDED AUSTRALITE BOWL FROM PORT CAMPBELL DISTRICT, VICTORIA, AUSTRALIA

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## Abstract

A folded australite (tektite) from Goudie's Lookout, Victoria, was a thin oval or boat-shaped bowl of approximate dimensions 17 x 8 x 4 mm. It developed from a small, elongated primary body by aerodynamic processes during passage at hypersonic speeds through the earth's atmosphere, but while still hot and plastic, the sides folded backward and were fused together. Peculiarities of shape arose from the excessive length of hinge relative to the perimeter of the bowl. No impact damage resulted at the earth's surface but subsequent terrestrial weathering effects are evident.

## Introduction

An australite specimen in the collection of the National Museum of Victoria (E 7852) was formerly No. 1257 in the private collection of the late Dr George Baker. It was found in March 1951 in a borrow pit east of Goudie's Lookout on the coast of Victoria, 3 km south of east from Port Campbell.

The specimen is of rare morphological type, the final shaping process being complete folding collapse. The partial folding of small australites is not rare. A selected group of 26 specimens from the Eastern Goldfields of Western Australia presently being examined includes seven specimens showing stages of folding ranging from early beginnings to half completed. Rarely, the folding of small round or oval australites progressed to the stage when the opposing sides made contact at the edges, which were fused together. The Goudie's Lookout specimen is the only one known to me in which folding collapse was so complete that the sides flattened against each other and fused together over almost their entire areas.

In conversation with the writer, the late Dr Baker referred to the specimen as his "pastie" australite, a most apt description of the form and the role of folding in its development.

## Description of folded australite

The australite has a hinge at one edge (lower profile of Pl. 9, Fig. A) with the ends of the hinge slightly reflexed from the main body as two 'ears'. The margins of the two folded sides have the form of two gently

curved lips (top of same illustration) with one lip slightly curled over the other. The lips are closely pressed together in the middle, but are slightly parted at the 'ends of the mouth'. The form is corrugated across the length with a strong kink near each end and a more gentle curve between (Pl. 9, Figs. B and D).

The overall dimensions between tangents to the irregularly curved shape and in the conventional sequence (length and width in planes normal to the line of flight, depth parallel to the line of flight) are 19.5 x 3.4 x 6.7 mm. The foregoing statement assumes that flight orientation was momentarily maintained after folding occurred. The thickness in the central, less distorted part of the specimen is in the range 2.0-2.3 mm. The glass was therefore generally a little more than 1 mm thick prior to folding.

The mass of the australite is 0.4056 g and the specific gravity  $2.428 \pm 0.002$  (three determinations by loss of weight in toluene at temperatures 26.2-27.0°C).

A group of bubbles trapped between the two folded halves of the specimen (Fig. 1A) is visible macroscopically. The largest bubbles have observable dimensions 2.7 x 0.45 mm and 2.6 x 0.8 mm; they may be considerably flattened in the third dimension. The pattern suggests a curving channel of escape of gas, some of which was trapped below the closed lips and forced to spread laterally beneath them as the sides pressed together. The bubbles have a total sectional area equal to about 4% of the sides.

A few bubbles of a smaller order of size

(generally  $<0.1$  mm) are visible microscopically within the glass. They are distinguishable from small bubbles of the previous group, which is at a depth of about 1 mm, by using a microscope with measurable working distance, focussing first on the surface of the specimen and then downward to the edge of the bubble.

The specimen is uniformly translucent, i.e. there is no indication of a core.

Lechatelierite inclusions are present in about usual abundance. They are very variable in form—narrow or stout, straight or curved, rounded or ovoid, occasionally of complexly curved shape—and they generally have dimensions in the range 20–140  $\mu$ m.

Examination of the liquid-immersed specimen between crossed polars shows distinctly birefringent bands adjoining the hinge and the lips, and very generally distributed, elongate, wispy areas of much weaker birefringence elsewhere. All of these extinguish parallel or sub-parallel to the hinge. The band along the hinge is understandable as the result of residual strain from the stretching of the glass around the hinge, but it is necessary to accept a later conclusion of this study to understand the generally distributed, weaker, residual strain responsible for birefringence elsewhere. The two folded sides of the specimen were initially convex outward and they were flattened against each other by the folding collapse. They have therefore been bent, but in the opposite sense to the main hinge, the bending having evidently been concentrated upon numerous sub-parallel, but locally divergent, minor axes.

The surface of the specimen is abundantly pitted. The largest pits have diameter 0.4 mm, but most are much smaller. The surface of the australite is the anterior surface of oriented flight together with the edge of the lip. The pits are not therefore bubble pits from the primary degassing and it is rare for bubble pits related to secondary reheating to be found except on protected surfaces of secondary glass—e.g. the rear surfaces of flanges. Most pits, if not all, can be attributed to solution etching by the chemicals of soil water or other terrestrial agencies since the australite arrived on the earth's surface. Schlieren of slightly different chemical compositions are also evident as the

result of differential etching, especially towards the 'ears' of the specimen. A small area of fragile scaly surface has been developed, and extraneous material is firmly embedded within it.

### Reconstruction of pre-folding form

For the purposes of reconstruction, the following additional measurements were made:—

|  |         |
|--|---------|
| Length of hinge (lower profile of Fig. 1B), the pre-folding 'length'   | 21.1 mm |
| From outer edge of the lower lip as seen in Fig. 1B around the hinge to the outer edge of overhanging lip, i.e. the flattened out, pre-folding 'width' | 13.3 mm |
| Length of outer edge of lip, the pre-folding perimeter   | 42.5 mm |

If the pre-folding form had been simply an oval plate of dimensions 21.1 x 13.3 mm, it would have had perimeter about 54.7 mm (calculated as an ellipse) and could have folded with a straight line hinge; the available perimeter was deficient about 22%. The presence of the 'ears' and the crumpling along the length also indicate the deficiency of perimeter—or stated otherwise, the excessive length of hinge—for such a simple type of folding.

Clearly, the form was not a plate but a bowl in which the 21.1 mm and 13.3 mm were the lengths of the outer curves of the longitudinal and cross sections respectively. The three measured lengths would be in correct ratio in a bowl of appropriate proportions.

The lip of a bowl which has suffered no folding is generally in a plane normal to the line of flight, i.e. the depth dimension is common to longitudinal and cross sections, each of which usually approximates to a semi-ellipse. Provided that the length/width ratio ( $L/W$ ) was not too large, the perimeter of the bowl would also have approximated to an ellipse.

Using the measured lengths above and the formula for perimeter of the ellipse, three simultaneous equations were set up, each equation including two semi-axes of the elliptical sections of the bowl. Their solution gave the dimensions of the bowl as 17.7 x 8.6 x 4.15 mm. The  $L/W$  was 2.06.

Fenner (1940, p. 312) has defined the arbitrary  $L/W$  limits of the increasingly elongated series from broad ovals through narrow ovals to boat forms as  $> 1 \leq 4/3$ ,  $> 4/3 \leq 2$ ,

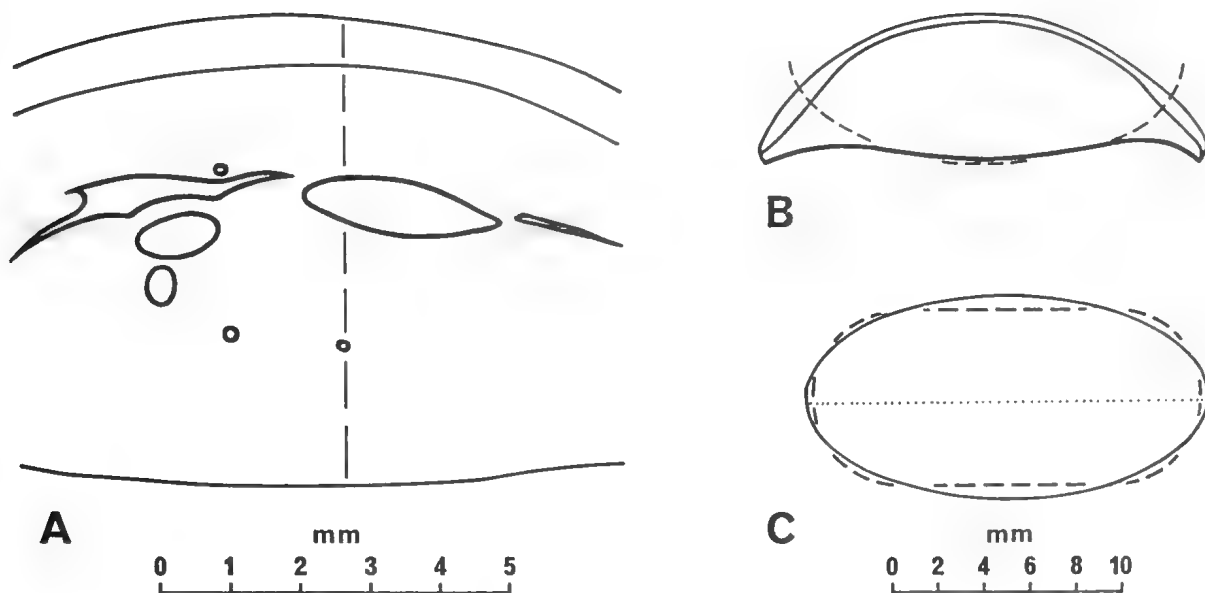


Fig. 1—A, Group of bubbles trapped between sides of folded australite near mid-line (broken line) as seen in side elevation. Hinge and direction of flight towards bottom of page. B, Sketch of folded australite showing site and form of hinge before folding (broken line) and hinge after folding (heavy line of lower profile). C, Plan views looking down line of flight of two alternative reconstructions of the bowl which was parental to the folded australite. Oval (solid line), boat shape (broken line), future hinge fractionally off main axis (dotted line). Scale at lower right applies to B and C.

and  $> 2$  respectively. In an uncompleted study of the degree of elongation at which oval forms are transitional into parallel-sided forms, I have found that 67 out of 72 parallel-sided specimens (93%) have  $L/W > 2$ , and that 111 out of 131 oval specimens (85%) have  $L/W \leq 2$ . The study includes Fenner's narrow ovals only, but if broad ovals were also included, the percentage of ovals with  $L/W \leq 2$  would certainly exceed 90%. Fenner's arbitrary limiting figure appears to be well chosen since there are about equal probabilities that a specimen with  $L/W \leq 2$  will be oval in shape or parallel-sided. It is therefore probable that a form with  $L/W > 2$  would be parallel-sided rather than oval.

Consideration of the parallel-sided form does not introduce a fourth variable because the

ends of such forms are closely semicircular. Thus the equation for perimeter of the bowl is

$$2\pi b + 4(a - b) = 42.5$$

where  $a$  and  $b$  are the same symbols for semi-length and semiwidth as were used for the oval bowl. The other equations are unchanged and their solution yields the dimensions  $16.94 \times 7.60 \times 4.66$  mm, with 9.3 mm lengths of parallel sides. Such a bowl would be closely similar in form and proportions to a boat-shaped bowl from Port Campbell district described and figured by Baker (1963, No. 28), but about  $1\frac{1}{2}$  times as large. The alternative solutions are:—

|                  |   |             |
|------------------|---|-------------|
| oval bowl        | $18 \times 8\frac{1}{2} \times 4$ mm            | $L/W \ 2.1$ |
| boat-shaped bowl | $17 \times 7\frac{1}{2} \times 4\frac{1}{2}$ mm | $L/W \ 2.2$ |

The outlines of the lips are very gently curved as in ovals, but originally straight sides may have been bent slightly as a result of folding of the bowl. The gaping at the 'ends of the mouth' is not a feature favouring the more open-ended boat shape. The same gaping is present in specimens which were initially round or oval. The maximum angle of folding ( $180^\circ$ ) would be necessary at the 'ends of the mouth' to bring the sides into contact. The present form of the specimen does not allow confident choice between the oval and boat shapes, which differ little in plan view (Fig. 1C).

The glass thickness towards the centre of the bowl was about 1 mm. The central cavity was therefore 3-3½ mm deep.

### Mechanics of folding

The following appear pertinent to a consideration of the mechanics of folding:—

(a) About the time when atmospheric shaping processes were complete, a form only 1 mm thick would be hot throughout and therefore capable of folding plastically.

(b) The two folding halves were convex outward in the general style of a hinged bivalve. Contact would be made first at the lips and, with further pressure, would be established inward from both the lips and the hinge.

(c) Because the hinge was a curved line, folding would tend to straighten it, the ends of the hinge moving outward and downward. (Visualize a trough being folded upward on a transverse hinge; the sides bulge as the hinge straightens to the horizontal.)

(d) The surplus length of hinge, estimated as about 7 mm, would need to be accommodated in some way if the sides were forced into close contact over most of their areas.

### Development and history of folded specimen

A small, elongated australite primary body developed bowl shape during passage through the earth's atmosphere at hypersonic speeds (Baker 1958, pp. 380-382). The bowl was oval or boat-shaped, of approximate dimensions 17 x 8 x 4 mm, but the glass of the frontal region was only about 1 mm thick and hot throughout. After active shaping ceased, the temperature fell, and especially rapidly when the speed was reduced to the stage that heat generation failed to equal heat losses. Late in the stage of active shaping when the form was essentially complete, or early in the succeeding stage while the temperature was still high, the bowl collapsed suddenly by the sides folding upwards (i.e. backward from the direction of flight) on a hinge which was approximately coincident with the 'keel' of the bowl. The lips flattened against each other and adhered firmly. While flight orientation was

momentarily maintained, air pressure forced the side closer together, contact proceeding inward from the lips and from the hinge. Most of the 'dead air' posterior to the bowl escaped before contact was established or through the 'corners of the mouth', but some was trapped and separated into a trail of bubbles. The hinge was straightened by the folding and because the sides made firm contact over about 96% of their areas, the surplus length of hinge was accommodated by being bent further downward as 'ears' and by some crumpling along the length. Momentarily later, the now misshapen australite lost its fixed orientation relative to the line of flight and tumbled irregularly, but it remained hot long enough for the sides to be firmly fused together. It reached the earth's surface at low velocity as a cold body and suffered no recognized damage on impact. Terrestrial agencies have since developed some pits and have etched schlieren differentially and lightly, but the state of preservation would be regarded as unusually high on any standards except those of the uniquely well-preserved Port Campbell australites.

### Acknowledgements

I thank the Council and Director (Mr J. McNally) of the National Museum of Victoria and the Curator of Minerals (Dr W. D. Birch) for allowing me to examine the folded australite specimen, and I take the opportunity of recording my indebtedness to the late Dr George Baker, whose usual kindly and meticulous criticism of my manuscripts was sadly missed on this occasion.

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**Description of Plate 9****FOLDED AUSTRALITE BOWL**

Four views of folded australite bowl as specimen is rolled over from top towards bottom of page.

Figure A—Side elevation, hinge of folding at bottom,

lips at top. Direction of flight towards bottom of page.

Figure B—Lips. Note folding along the length.

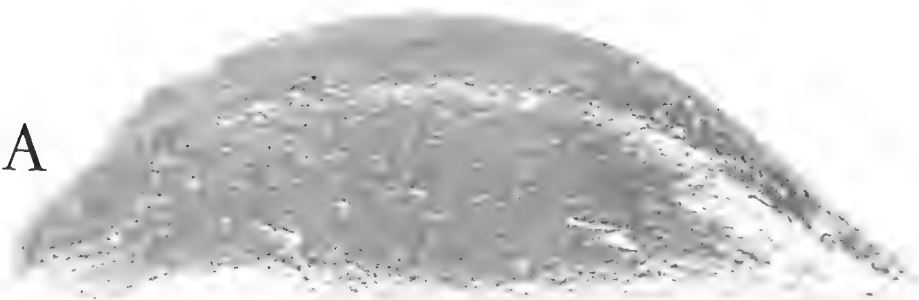
Figure C—Opposite side to A, direction of flight towards top of page.

Figure D—Hinge area.

(Photos A-D by Mr M. Joyce, Kalgoorlie.)



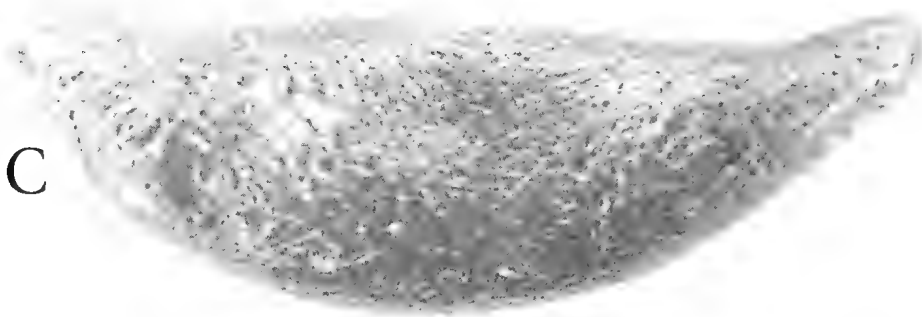
A



B



C



D







# SMALLEST RECORDED AUSTRALITE, WITH NOTES ON OTHER SMALL AUSTRALITES

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## Abstract

The smallest recorded complete Australian tektite, recently discovered 9 km NNE of Princetown, Western Victoria, is minute, oval, shallow bowl-shaped australite weighing only 0.0132 gm, with a specific gravity of 2.430. It is practically a complete form and similar to other small australites in that no central core region has survived the passage through the atmosphere without undergoing melting. Three other complete australites have also been found in the Port Campbell-Princetown region of Western Victoria, the weight of each specimen being noteworthy in respect to other small australites previously recorded. All the small bowl-shaped australites are well-preserved, exhibiting the secondary effects of aerodynamic processes which have acted upon the small primary spheroids of tektite glass during their entry through the earth's atmosphere.

## Introduction

Approximately 50,000 australites have so far been brought to scientific notice, in papers dealing with the classification of either individual collections or specimens from particular localities, or specifically describing certain australites on the basis of uniqueness or form or size.

It is understandable that many papers have described large australites, but, unfortunately, there has been an almost complete neglect in the recording of smaller specimens. For the purpose of this paper, an upper limit of 100 mg was set as the weight of a small australite. A thorough search of the available literature has revealed that the seven complete australites described in this paper are the only ones below this limit which have been documented. Three have already been described elsewhere (Baker and Cappadona, 1972; Baker, 1946, 1963) but the other four, including the smallest, are described here for the first time.

With the exception of Australite 4 (Table 1), which is lodged in the National Museum of Victoria, all other australites referred to remain in the private collection of W. J. Cappadona, of Dandenong, Victoria.

## General

The weight, specific gravity and dimensions of the seven small australites are presented in

Table 1, together with information on the year of discovery of the specimens and their location. The dimensions listed have been approximated for ease of comparison. The range in weights of the australites is from 13.2 mg to 97.0 mg. The specific gravity values vary within the range of 2.430 to 2.405 with an average value of 2.415.

The smallest known recorded australite is an oval, shallow bowl-shaped form and was discovered by one of the authors (WJC) in September, 1975, approximately 9 km NNE of Princetown on the Western Victorian coast. It was found resting on its edge in a rain-washed gutter of greyish, leached, sandy clay on Fordes Road (track), which is a closer-settlement road running off the main Princetown to Cobden road. The specimen had obviously been dislodged from its original resting place by heavy rain which had fallen over the previous two days. It could not have been transported any great distance, as the gutter in which it was found originated only 1 m from a dense vegetation cover on undisturbed top-soil.

The actual dimensions of the smallest australite are length 4.3 mm, width 3.8 mm, depth 0.2 mm, and thickness of glass 0.4 mm. If the plan aspect of this specimen is assumed to be elliptical, then, based on the average thickness, an estimate of the loss in weight due to removal of a small circumferential fragment is less than 2% of the total.

While etching and pitting after impact have obviously reduced, to varying extents, the original masses of the small australites, the loss is not considered to exceed 5%. (See next section.)

An interesting feature is the chronological order in which the small australites were found. Prior to 1970, the only small australite to be recorded was specimen 4, which was discovered by George Baker in 1937. The other six have been found within the last five years and three of these weigh less than specimen 4.

It is also interesting to note that specimens 1, 2, 3, 5 and 7 were all found in the same general area, 7 to 10 km NNE of Princetown. This is despite the fact that one of the authors (WJC) devoted a greater proportion of his time searching in similar australite-bearing subsoils elsewhere, to reveal only one other small specimen.

### Features of the australites

#### *No. 1*

The smallest australite is a shallow oval bowl, the surfaces of which have been very deeply etched. The small chip removed from the margin has a rounded outline on the anterior surface and may represent a bubble pit, as one other spherical cavity occurs on this surface close to the margin (Pl. 10, fig. 1). The flow line pattern on the anterior surface has largely been obscured by pitting. The posterior surface shows flow lines concentric with the margin. There is no clearly defined core. A large bubble cavity nearly 1 mm across occurs in the marginal area (Pl. 10, fig. 1).

#### *No. 2*

The specimen is a slightly imperfect oval in plan. The anterior surface is strongly convex, more so in end-on elevation than from the side (see Baker and Cappadona, 1972). The posterior surface is concave. The complex flow line pattern is a result of differential etching of streaky, rather inhomogeneous tektite glass during burial (Baker and Cappadona, 1972). Etch pits are rare and generally small, with the exception of two deeper craters, up to 1 mm across, on the posterior surface (Pl. 10, fig. 2).

#### *No. 3*

The specimen is a shallow oval bowl-shaped form. The posterior surface is gently concave and marked by three large bubble cavities in the marginal area. The central region is 'apple-shaped' and is surrounded by a set of concentric flow lines. The entire posterior surface is strongly pitted such that no trace of flow lines remain in the marginal area. On the anterior surface, heavy etch pitting has reduced the original flow lines to radial-like traces (Pl. 10, fig. 3).

#### *No. 4*

This oval, tray-like form without a central core has been described by Baker (1946). 'The flat anterior surface curves at the edges and the posterior surface is slightly concave; both surfaces have strongly marked, contorted flow lines, and a bubble cavity, 1 mm across, forms a small hole through the specimen.' (Pl. 10, fig. 4.)

#### *No. 5*

This specimen is a shallow bowl, almost circular in outline. The anterior surface is strongly marked with flow lines centred about the central dome. Bubble pits are abundant. The posterior surface is shallow and concave and also strongly marked by flow lines, which tend to form a knot-like arrangement in the central portion of the surface (Pl. 10, fig. 5). There are several quite deep etch pits and a few bubble cavities.

#### *No. 6*

This is the best preserved of the seven small australites. It has an irregular ovoid outline and is deeply bowled. The strongly convex anterior surface has a flow line pattern which passes directly over the crown on the surface, but at a slight angle to the long axis of the ovoid outline. The flow lines tend to fan out on either side of the dome, which is off-centre (Pl. 10, fig. 6). The posterior surface is deeply concave. A distinct central region has an uneven surface and a quadrilateral outline, with its long axis parallel to that of the whole australite. The flow line pattern is complex but continuous across the central portion and the

marginal area. A large bubble pit occurs within the central region and another on the margin (Pl. 10, fig. 6). Several smaller pits mark the anterior surface.

#### No. 7

This is a dish-like oval, shallow bowl. Both the posterior and anterior surfaces are heavily pitted, with several etch pits reaching 1 mm across. Only faint traces of strongly curved flow lines have survived the etching on the posterior surface. There is no central core evident on the posterior surface (Pl. 10, fig. 7).

### Discussion

Although there have been only seven small (i.e. less than 100 mg) australites described out of 50,000, it is likely that they are not as rare as this proportion suggests. Their small size obviously mitigates against their discovery by normal visual observation owing to the limitations of human eyesight and to the amount of sustained concentration required.

It is interesting to contrast these small australites with the glass microbeads (so-called microtektites) which are being recovered from oceanic sediments. It has been pointed out in a previous paper (Baker and Cappadona, 1972) that the glass microbeads are fundamentally primary forms and do not exhibit the secondary effects of aerodynamic sculpturing, a feature common to all australites. The effect of the aerodynamic processes which have acted upon the primary spheroid of tektite glass during passage through the Earth's atmosphere is clearly evident even in the smallest australite (see Pl. 10, fig. 1).

The name 'Tektite' was introduced by Professor F. E. Suess of Vienna in 1900 and was derived from the Greek word 'tekton' meaning molten. This name was coined to describe specific objects which had been aerodynamically sculptured during hypersonic flight through the Earth's atmosphere, and which duly assumed a secondary form.

It is indeed unfortunate that Professor Suess's definition has been extended to include glass microbeads, the form of which bears no relation to the classical connotation of the word 'tektite'.

It is known that the burning of certain Australian timbers rich in opal phytoliths, or the burning of haystacks (Baker, 1968) will produce glass microbeads comparable to recorded 'microtektites' (Glass, 1974). From a physical standpoint, such glass microbeads are formed by the irregularly shaped combustion products assuming primary forms governed by surface tension considerations during their semi-viscous phase of solidification. Solidification takes place at relatively low bead velocities, governed by thermal updraughts and, consequently, no secondary effects are evident in their final form.

In contrast to glass microbeads where the final forms are the result of a cooling process at low velocities, it must be remembered that the secondary forms of australites are the result of a heating process at high velocities.

Having regard to the contrary nature of the formation mechanisms of glass microbeads, it is the authors' opinion that glass microbeads do not warrant inclusion in the study of the tektite phenomena.

### Acknowledgement

The authors wish to thank Mr F. Coffa for photographing the australites.

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 GLASS, B. P., 1974. Microtektite surface sculpturing. *Geol. Soc. Am. Bull.* 85(8): 1305-1314.

### Description of Plate 10

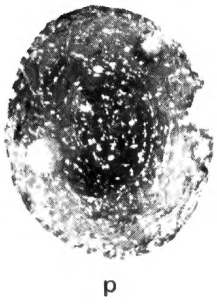
*Photographs of small australites listed in Table 1*

- Figure 1.—Australite No. 1, posterior (p) and anterior (a) surfaces\*.  
 Figure 2.—Australite No. 2, p. and a.  
 Figure 3.—Australite No. 3, p. and a.  
 Figure 4.—Australite No. 4, p. and a.  
 Figure 5.—Australite No. 5, p. and a.  
 Figure 6.—Australite No. 6, p., a. and side elevation.  
 Figure 7.—Australite No. 7, p. and a.

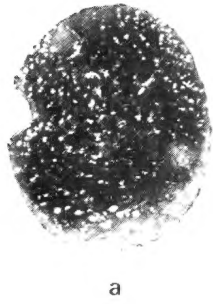
\* See Table 1 for dimensions of australites.

TABLE 1  
Small australites in order of increasing weight.

|   | Weight<br>(mg) | Specific<br>Gravity | Length<br>(mm) | Width<br>(mm) | Depth<br>(mm) | Thickness<br>(mm) | Year of<br>Find | Location of Find            | Reference<br>(where applicable)                      |
|---|----------------|---------------------|----------------|---------------|---------------|-------------------|-----------------|-----------------------------|--|
| 1 | 13.2           | 2.430               | 4.5            | 4             | 0.25          | 0.25-0.5          | 1975            | 9 km NNE of<br>Princeton    | Baker & Cappadona<br>(1972)                          |
| 2 | 26.0           | 2.410               | 5.0            | 3             | 2.00          | 0.5               | 1971            | 10 km NNE of<br>Princeton   |  |
| 3 | 57.7           | 2.405               | 7.0            | 6             | 0.25          | 0.5               | 1974            | 10 km NNE of<br>Princeton   |  |
| 4 | 64.5           | 2.406               | 9.0            | 6             | 1.00          | 0.5               | 1937            | 10 km E of<br>Port Campbell | Baker (1946)<br>Baker (1963)<br>(Nat. Museum E 7842) |
| 5 | 67.1           | 2.420               | 6.5            | 6             | 0.50          | 1.00-1.5          | 1973            | 9 km NNE of<br>Princeton    | Baker & Cappadona<br>(1972)                          |
| 6 | 96.9           | 2.425               | 8.0            | 7             | 1.00          | 0.25-0.5          | 1975            | 20 km NE of<br>Princeton    |  |
| 7 | 97.0           | 2.410               | 8.5            | 7             | 1.00          | 0.25-0.5          | 1970            | 7 km NNE of<br>Princeton    |  |



1



a



p

2



a



p



6



a

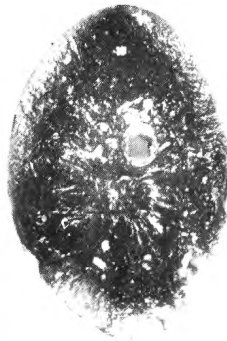


p

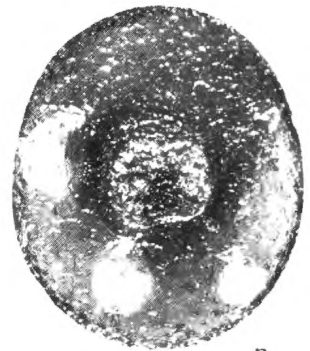


p

4



a



p



a

5

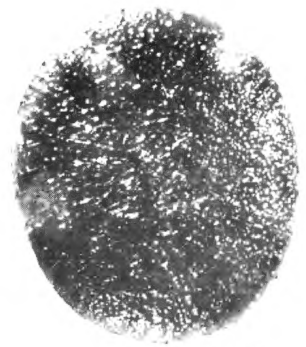


p

7



a



a

3







